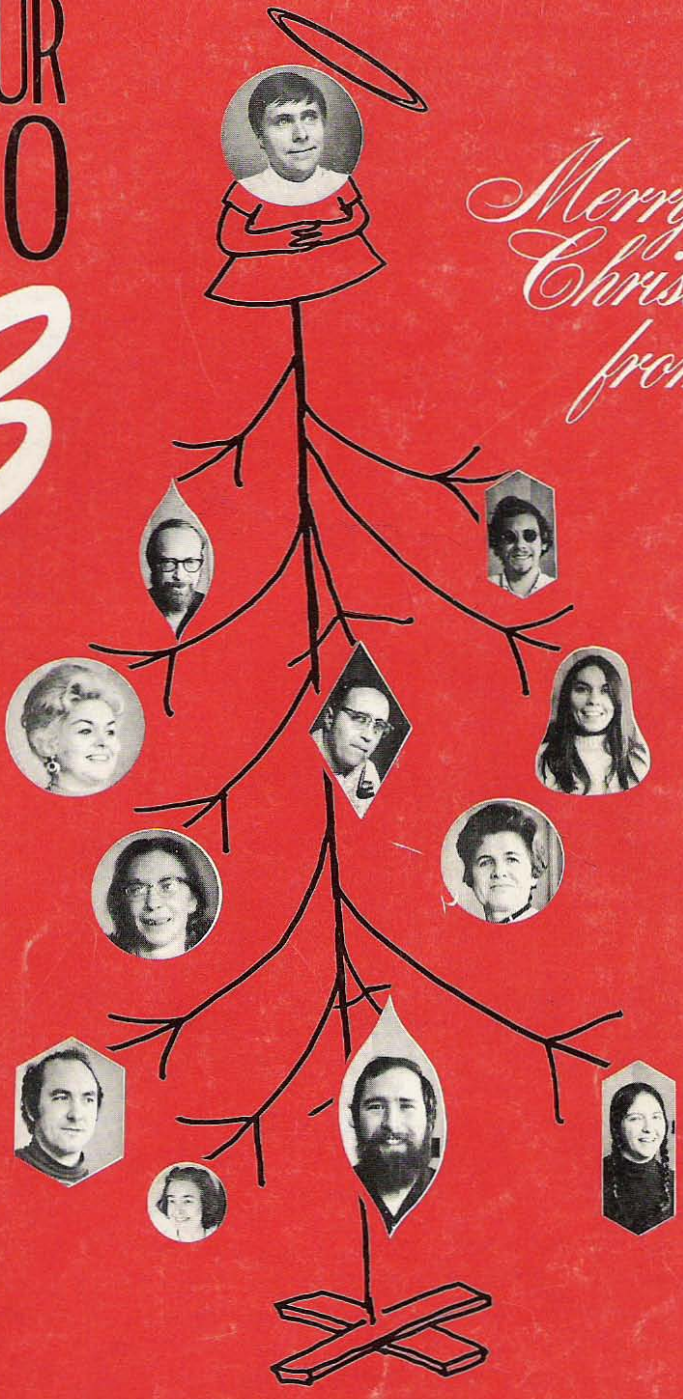
AMATEUR RADIO 73

$1.00
(one dollarette)

Merry Christmas from 73

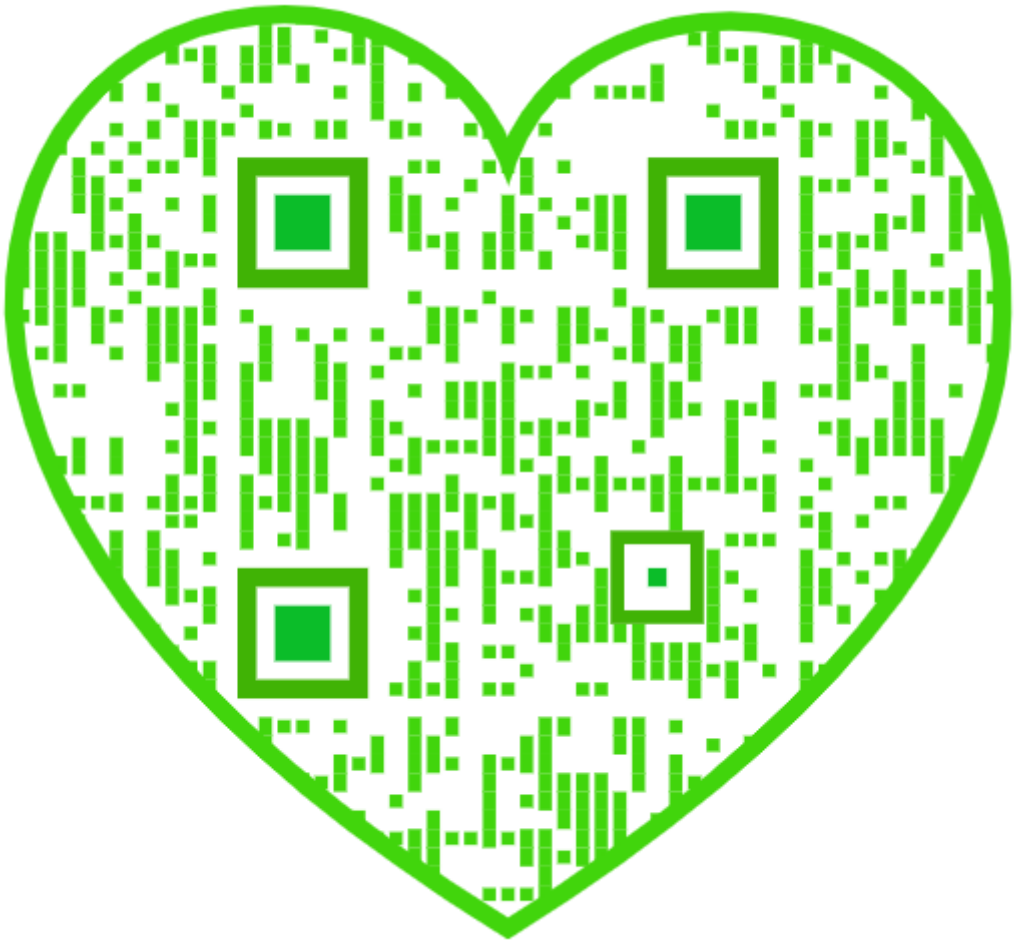


30 Letter Code Memory
You Can Build
Code Shorthand
Indoor Quad

ALL BAND your 40m quad
73 Tests the:
Curtis Identifier
Gam Gain Vertical

Gladding 25
TPD Car Alarm
2 Meter DSB transmitter
Mobile Theft Alarm

26009



73 MAGAZINE

#135 DECEMBER 1971

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COVER: A fairly merry Christmas from the dedicated little group that brings you 73 each month. Reading down, left to right, we have controversial Wayne Green, editor, resident gourmet cook and bon vivant. Phil Price is next, our architect of the newspages, solver of circulation miseries and about 50 other jobs. Eric Falkof K1NUN, the new assistant editor, will be the scapegoat for all of Wayne's blunders. Aline Coutu, one of the reasons 73 is doing so well with advertising, is a church organist as well as advertising manager at 73. Roger Block, art director, designs covers like this one, draws hilarious cartoons, and smokes a stink-pot pipe. Nancy Estle, our artist, puts together most of the pages of 73 as well as a lot of the ads. Isn't she a doll? Ruthmary Davis fights the vagaries of the IBM composer to set the type for 73 and our growing line of books. Dotty Gibson handles the subscriptions and tries her best to deal with the seemingly insane computer which tries to screw up our mailing list every month. Biff Mahoney tends the cantankerous presses in the 73 printing department. He has developed an impressive vocabulary of blue words which seem to help keep things running. Barbara Block keeps your information requests flowing smoothly (please send in one to her today with a little note of thanks and let her know that she is not forgotten), a chore which helps Aline keep the advertisers happy and, in turn, 73 in business. Taylor Sage does almost everything else. . .like keeping everything running despite the best efforts of our machines to self-destruct, getting the mail, putting on a new roof, binding books and magazines, and etc9. Gigi Sage, Taylor's wife, bookkeeps, making herself known primarily to delinquent advertisers. Taylor and Gigi live in a nice little place they call Motley Gardens out in the woods at the end of a long driveway. If you find yourself in New Hampshire please stop in and say hello to all of us!

Amateur Radio

DECEMBER MCMLXXI Monthly Ham

21 CB'ERS INDICTED

Reprinted from The Cedar Rapids Gazette: October 9, 1971.

DES MOINES (UPI) – A federal grand jury has returned 121 indictments against 21 Polk County residents on 14 different violations of the Federal Communications Commission regulations.

U.S. Attorney Allen Donielson said it was the first time a grand jury anywhere in the nation had indicted citizen band radio operators for alleged violations of the FCC rules.

The 21 persons indicted, all members of a citizen band radio operator club called "Apollo," were accused of making it impossible for legitmate users of citizen band radios to transmit messages in the Des Moines area.

Donielson said the indictments climaxed a nearly eight month investigation by the FCC, the grand jury and his office. He said some of those named in the warrants were licensed citizens band operators and some were not, and all the alleged violators were "using the citizens band like a ham radio operation."

While a "ham" radio operator can use more power and operate on a wider group of frequencies, Donielson explained, a citizens band radio operator is more limited in frequencies and power.

He said the violations included talking excessive distances, using nicknames instead of designated call letters, and using overheight antennas.

Donielson said the law provides 14 different penalties for the violations, ranging from two years imprisonment or a $10,000 fine, or both, down to a $500 fine.

Through Repeaters...

HAM FM BRINGS AID

by Peter Lascell W4WWQ

On October 3, Amos Rhames K4WQS came upon an automobile accident three miles south of the Virginia–North Carolina state line on US-29. At 11:40 AM, Amos put out a call through the Danville, Va. repeater (WB4QWP, 28/88) for any N.C. stations to make a call to the N.C. State Police. Hearing no reply from Carolina stations, W4WWQ, Lynchburg, Va., replied offering to call the Virginia State Police to see if they had contact with the N.C. authorities. The call was made but they didn't have interstate contact.

A call was then put out by W4WWQ via the Lynchburg repeater (WB4HCX, 34/94) for N.C. stations. A reply came from Bill WB4AXH in Smithfield, N.C. about 150 miles from Lynchburg and 100 miles from the accident scene. Bill contacted his local police department who in turn put the information on the N.C. State Computer Network at 11:50 AM.

While Rhames was at the scene directing traffic on what has been said to be the most heavily traveled two lane road in N.C., he maintained contact with both repeaters.

The state police car arriving at the scene at 12:18 PM had been a few miles south on a radar assignment. It took ham radio FM ten minutes to establish and pass information over the 330 mile round-robin circuit and took the police thirty minutes to move a car about 15 miles.

As it turned out, there were no injuries but there were some hot tempers over the crinkled metal blocking both lanes of traffic. The following stations participated: K4LKQ, K4WQS/M, K4YZR, W4WWQ, WB4AXH, WB4MBO, WB4QXE.

Former Morse Operators Have International Club

When it became apparent that the whole telegram industry would go into automation, a number of active and former telegraph operators in the Western Union, railroads, brokers' offices, private wire systems, news bureaus and others decided to form an organization to perpetuate the achievements of Samuel F. B. Morse and the traditions of the great fraternity of "brass pounders" as they were called. The Morse Telegraph Club was formed in California in 1942 and spread to 60 chapters throughout the U.S. and Canada. Today it has over 4,000 members.

Among those members are many hams, and former commercial wireless operators. Anyone who telegraphed the American Morse code or the Continental code (which hams use) for at least one year was eligible for membership. The big event each year for each chapter is the annual dinner on the last Saturday in April to commemorate the birthday of Samuel F. B. Morse.

On that Saturday each year the Western Union Telegraph Co. of 60 Hudson Street, New York City, has set up a circuit to all the cities requesting contact with the network, so that upwards of 60 cities are on this vast circuit in the U.S. and Canada. The Morse Club appoints a chief operator who tries to maintain priorities on the big circuit, and it functions all that Saturday. Wires are cut into halls, hotel dining rooms, or wherever the chapter is gathered for the annual get-together.

The proceedings and other Morse Club news, including several columns of Morse Club's ham news are published five times a year in a tabloid-size newspaper, *"Dots and Dashes."* Last year the Morse Club opened its membership rolls to hams, too. Dues are small.

Those interested may write O. Hugh Braese, President, Morse Telegraph Club, 1501 West Shields Avenue, Fresno, Calif. 93705

News Pages

GOLDWATER ELECTED PRESIDENT

Senator Barry Goldwater has been elected president of the Quarter Century Wireless Association for the 1972–1973 term. QCWA, which was founded in 1947, is a non-profit international organization of radio amateurs who have been licensed for 25 or more years. Current membership is over 5200 of which more than 450 have been licensed for 50 or more years.

Senator Goldwater operates station K7UGA in Scottsdale, Arizona and station K3UIG in Washington, D.C.

INTERNATIONAL HAM PHONE PATCH LINKS AILING SON, PARENTS

(Reprinted from the Columbia (MO) Missourian.)

The University ham radio station in Brady Commons reached Central America Saturday night to reassure a University professor whose son was critically ill.

Robert E. Bray, University assistant professor of economics, was contacted Saturday by the American Consulate in Tegucigalpa, Honduras. A spokesman said his son David, 23, was crtically ill with meningitis. David was touring South Central America on foot.

"They (the consulate) told us very little, just enough to be alarming," Bray said. "They said he was very ill with spinal meningitis, and if we didn't send $650 immediately he wouldn't receive proper treatment."

Wanting more information about his son's condition, Bray called a relative who worked in the State Department and a Jesuit priest in Maine who had worked in the State Department in Honduras as a missionary a few years ago. He asked them to try to make contact with his son.

Bray's problem was solved quite unexpectedly. Wally Grossman, a friend of Bray's, called him Saturday morning concerning another matter. When he heard Bray's problem, he suggested Bray go to the ham radio station at the University Brady Commons, and attempt a hookup with Honduras.

Steve Kahle, a graduate student in engineering, took over the radio. Kahle, son of Louis G. Kahle, University professor of political science, had attended University High school with David Bray.

The hookup was complicated and took more than an hour, Bray said. Kahle first reached the Canal Zone, where an operater linked him with Miami. Miami completed the link to Tegucigalpa.

Kahle talked with David Bray and was able to ascertain that he was feeling better. But the Brays wanted more information, and a new link was made, this time through Coral Gables, Fla.

"We found our son quite ill with meningitis, but not as serious as we had believed," Bray said. "He has to be in the hospital for two weeks. We were concerned not only with the possibility of death, but also with the possibility of brain damage. My wife is a nurse and she realized the serious implications more than I. We realized he needed prompt treatment." The Brays sent the needed money through their local bank.

HOLLYWOOD ARC CONTEST

The Hollywood Amateur Radio Club announces its first annual Operation's Day celebrating the first anniversary of its club call, WB4TON. They expect to have at least two transmitters in operation for the full 30-hour period and offer special QSL's and certificates to participating stations.

Date: January 8 and 9, 1972
Time: 1700Z Sat. to 2300Z Sun.

Frequencies:	CW	SSB
	3570	3930
	7070	7230
	14070	14330
	21070	21430
	28070	28530

Exchange: RST, state, province, or country, and name of operator.
Awards: Special QSL's to stations making contact with WB4TON during the 30-hour period.
Certificates to stations working WB4TON on both CW and SSB.
Certificates to stations working WB4TON on 5 bands. (Any combination of CW and SSB)
Application: Send SASE to W4OZF along with your QSL and a list of all contacts made to WB4TON during Operation's Day to W4OZF, Contest Chairman, 2311 West Nassau Drive, Miramar FL 33023.

HOT GEAR

Starting this month, 73's Hot Gear listing will include a cumulative list, providing a running checklist for hams and dealers to check before buying used equipment. Items will be kept on this list for ten months. Each entry consists of the make and model of the stolen equipment, identification of type of gear if necessary, the serial number and the date of the issue of 73 in which a full listing, with owner's name and call, can be found.

Hallicrafters SR46A	Xcvr	#446100	9/71
Regency 2	Xcvr	#04-03505	11/71
Sonar FM-3601	Xcvr	#1003	11/71
Collins 75A-4	Rcvr	#804	12/71

Stolen from Marvin A. Mahre WØMGI, 2095 Prosperity Ave., St. Paul MN 55109:
Collins 75A-4 Receiver, Serial #804.

A 17-year-old ham in Japan is looking for a few ham pen pals around his own age. Kazuhiro Nakao (KH3IWT) lives about 5 miles east of Osaka and his mailing address is 196–9, Shimokosaka, Higashiosaka City, Osaka, Japan. This young man is interested in basketball and he wants to exchange notes of interest with other young adults. Please contact him right away if you are interested.

Attention DXers. ARRL has announced the addition to the Countries List of Annobon Island. Annobon Island is located off the west coast of Africa in the Gulf of Guinea. It qualifies as separate from Equatorial Guinea under point 2A of the DXCC Criteria. Confirmations for contacts with Annobon Island may be submitted starting October 1.

YO2RA

Stefan Rusu YO2RA, seventy-two years old, a ham since 1927, has held calls ER5AR, CV5AR and YR5AR. He worked all continents in 1938 with 3 watts; his present rig consists of a 13 tube receiver, Hertz antenna, and a 60 watt transmitter.

Hilary McDonald W5UNF/6

VIET NAM. Fred Laun W9SZR, HS5ABD, HI8XAL, etc., who is presently a Province Advisor in the Vinh Binh, along with Don Riebhoff K7CBZ, HS3DR, etc., are working hard to get permission for amateur radio operation in this country. They've had a lot of experience with that in other areas, so they just may make it where everyone else has failed. If you have any help to offer write to Fred Laun, JUSPAP/PPA Advisory Team 72, APO 96243 San Francisco.

Kure and Midway QSL cards for the W7UXP/KH6 DXpedition should go to KH6BZZ, no matter what else you may have heard. Bureau cards will not be accepted. Address 45–601 Luluku Road, Kaneohe HI 96744. Donations gratefully accepted.

KAMARAN ISLAND, VS9K, unavailable for about five years now, is expected to be in operation for a few days in early 1972 when Aldo ET3ZU visits there. The Labor Day operation from Jabal al Tair Island in the Red Sea netted over 7000 contacts . . . a very good score indeed.

AVES ISLAND, YVØ should be on in late October if the two radio amateurs accompany the scientific expedition to this remote island as expected.

JORDON, JY9DK was on for a few days form Amman. Darleen will be on from various spots around Europe during November and will be returning to the U.S. in December. SM5AEC is scheduled to be on from Jordan too, so it looks as if there will be no real shortage of JY calls on the bands. King Hussein JY1 still shows up frequently on the bands to reward the diligent DXers.

ZANZIBAR, 5H3LV is trying to get back there again in late December for those who missed Garth's last two visits there in Feburary and April 1970. By now there should be a fair demand built up.

(Thanks to the West Coast DX Bulletin)

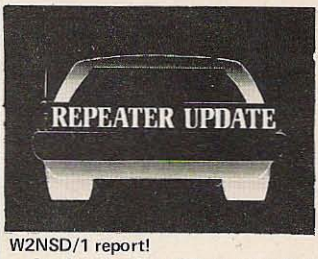
DX MAILBAG

Hi Wayne:

As per our contact the other night I am enclosing the shot of Gus Roblot FP8AP.

After some ninety 90 trips to the Newfoundland mainlaind with the ATTA BOY in which he brought ice cream to St. Pierre for sale on the Island, Gus has finally decided to retire his trusty little boat. To let the legend of the ATTA BOY live on, Gus has decided to move it up on the mountain side on St. Pierre on skids, and make a ham shack out of her, for visitor hams to use while on the island, as well as his own shack. Shown here with the ATTA BOY are left to right, George, Gus' son-in-law, Bridget, Gus' granddaughter, and Gus FP8AP.

Bill W1PFA



W2NSD/1 report!

On the morning of September 28th I noticed that the two meter band was unusually good. The WA1KGR repeater from Holyoke MA was pushing S-9 on the Standard, where it usually struggles in here about S-4 or so; good copy, but not overpowering. This perked in the back of my mind through the day and, when things went a little blah along about ten that night I headed for the top of Pack Monadnock in the Rover.

Sure enough, signals were excellent. I put the C.T. Power amplifier on the Standard, boosting it to about 80 watts output and made a try to get into WA2SUR 19–73 in New York City. I've tried them before, but never when they were as strong, running an S-2 with a lonnng slooow fade, taking perhaps fifteen minutes to go through a valley and back up again. I made it this time and quickly found myself talking to a bunch of good old friends through that extremely popular repeater. The most exciting contact for me was with Larry WA2INM, who wrote a lot of articles for 73 back in the early days and spent a good deal of time haunting the 73 offices in Brooklyn. Further, he did a good deal of the work of moving us up here, and then visited any number of times while he was going to college in nearby Marlboro VT. Larry was sitting in a bar in Greenwich Village with a TR-22, with his wife Jackie WB2BXY!

INTERNATIONAL AMATEUR RADIOCOMMUNICATION

The FCC has received notice from the Cambodian licensing authorities that pending government approval and eventual International Telecommunications Union notification, there would be no objection to communications between amateur Station XU1AA, Phnompenh, Cambodia, and U.S. licensed amateur stations.

The Commission has no objection to U.S. amateurs communicating with Station XU1AA.

Shifting to WA1KGK in Trumbull CT I added more old friends to the log, plus Jim K3VJH down near Washington, almost 400 miles away, and John K3IBN in Harrisburg PA. I could hear a lot more chaps coming through the Philly repeater on 76, but they were busy with themselves and weren't as excited over working New Hampshire as I was in contacting Philly, so nothing came of it.

The car battery, my perseverence and the band all failed about 2 AM, so I pushed the car to start it and headed home to bed.

Would there by an interest in a repeater contest? I know I would enjoy it, but perhaps I'm in a great minority. Perhaps one which would give one point for every contact made through a repeater, with a multiplier for the number of repeaters used. I'd win, of course, but what better way to set up a contest, right? With a minimum of 22 repeaters available from my nearby mountain, even without a beam, I have quite an advantage. If someone gives me trouble from down in Massachusetts on Mt. Greylock we could throw in a state multiplier to push me back over the top again.

Ken and I discussed an FM contest, but he was violently opposed to it. FMers aren't interested in DX and contests, said he. Maybe not, but a lot of chaps sure tried hard to contact me when the band was open and the rest, with one or two exceptions, cooperated fully. If I get letters of encouragement from a dozen states we can start mulling over the rules for a short fun contest, perhaps 24 hours on a Saturday night through Sunday afternoon. It won't take as many negative letters to turn the whole thing off . . . I discourage easily

DXing The Repeaters

The late September effects of the hurricane sliding up the coast were most pleasant for old timers on two meters. The band went wild, with the FMers finding Ohio repeaters banging into Maine and most of New England, and openings all over the place from the midwest down to Virginia. I drove to the top of my local mountain on three different nights and had a wonderful time working the gang in New York through WA2SUR 19–73. The temperature inversion was so pronounced that I could even see lights reflected way up in the sky from what must have been New Haven, well over 100 miles away.

My old buddy Frank W2OCM was boiling through the New Hampshire repeater W1ALE from Long Island and I worked him on a half dozen different repeaters in short order. My best DX for the evening was K8WKE in Utica Michigan who was hearing me through W1ABI in Vermont and coming through on 88 direct! My 34 receive channel was awash with signals from New York and New Jersey and I had better luck listening 34 and letting them hear me through one or more of the 34–94 or 34–76 repeaters.

Ernie W1FPT down in Bridgeport CT probably did the best of all with his 100 watts and beam. He worked all over the place. I wonder if we shouldn't think in terms of making a certificate available for working through 100 repeaters? Perhaps a tape cassette of the CW identifications coming back would be proof? I know I get a kick out of lifting a repeater out in Ohio or western Pennsylvania and hearing the identification come back.

CA	WA6SIN	Ventura Cty.	28–88
CO		Broomfield proposed	01–61
CO	WAØVUO	Denver	04–64
CO		Denver RTTY	10–70
CO	WAØVTV	Colo.Springs	16–76
CO	WØIA	Boulder	16–76
CO	WAØBAG	Saginaw Peak proposed	16–76
CO	WAØZCI	Monte Vista proposed	16–76
CO		Pueblo prop.	19–79
CO	WBØERV	Buckhorn Mt. No. CO	25–85
CO	WAØSNO	Pueblo linked to WØENA	28–88
CO		Denver simplex	88–88
CO		Denver prop.	31–91
CO	WØWYX	Denver Squaw Mt.	34–94
CO	WAØSNO	Pueblo	34–94
CO		Denver prop.	37–97
CO	KØOVQ	Denver CD 146.82–147.30	
CO		Arapahoe Cty. CD 147.06	
CO		Prop. CO simplex	58–88
CO		State RACES	
CO	WAØVVC	Denver 145.20 444.35–449.35	
CO	WAØFTM	Broomfield 444.40–449.40	
CO	WØWYX	Squaw Mt. 444.45–440.45	
CO	WØIA	Boulder 444.55–449.55	
CO	WBØERV	Buckhorn Mt. proposed 444.85–449.85	
CO	WØENA	Pueblo 53.0–52.525	
CO		Statewide simplex 52.525	
CT	K1IGF	New London	19–94
FL	WB4KNQ	Merritt Island 443.1–448.1	34–76
GA	WB4KLM	Augusta	34–94
HI	KH6EQF	Honolulu 449.15–444.15	
HI	KH6FOX	Waikiki	16–76
HI	KH6EQK	Mt. Holeakala 444.15–449.15	
IA	WAØVVA	Linn Co.	34–94
IA	KØJIU	Council Bluffs	22–82
IL	WA9DZO	Chicago	10–85
IL	WA9DZT	Chicago 52.76–52.64	
IL		Chicago	46–88
IL		Chicago 147.40–147.81	
IL	WA9ORC	Chicago 448.75–443.75	
IL	WA9TEC	Decauter	34–94
IL	WA9SGJ	Graymont	16–94
IL	WA9EAT	Joliet	28–987
IL	K9CLW	Winnebago 82–147.30	
IL	WA9LIV	Waukeegan - (1950 Hz Wimot WI access)	34–76
IL	WA9ORC	Chicago	34–76
IL	WB9AEF	Peoria	34–76
IL	W9DGV	Rock Island	34–94
IL	W9DGV	Rock Island	34–76
IL	K9CLW	Winnebago 82–147.30	
IL	WA9LIV	Waukeegan (1950 Hz Wimot WI access)	34–76
IL	WA9ORC	Chicago (1800 Hz no., 2000 Hz so.)	34–76
IN	W9ZPP	Evansville 52.92–52.525	
IN	K9JSI	LaPorte	22/34–76
KS	WAØVVW	Pittsburg	34–94
LA	WB5CDP	Monroe 52.827–52.525	
LA	W5MLE	Morgan City (+440.0–146.94 & 444.5–52.525)	34–94
MA	K1FFK	Mt.Greylock 52.78–.525	
MA	WA1KFZ	No. Adams	10–70
MI	WB8CSA	Benton Harbor	34–94
MI	W8MAI	Benton Harbor	94–76
MI	K8WKE	Utica	28–91
NH	WA1KGO	Peterborough (was 37–73)	19–79
NJ		Oakland	16–91
NY	WB2BLU	Yonkers	31–91
OK		Okla City	16–76
RI	W1HQV	Providence	16–76
SD	WAØVVG	Sioux Falls	34–94
SD	WØBXO	Brookings	34–94
TN	W4BS	Memphis 444.0–449 0	22–76
TX	WA5SNJ	Pasadena	34–94
VA	WB4QDP	Arlington(DC)	31–91
WI	W9ROM	Milwaukee (2250 Hz Slinger; 1700 Hz Grafton)	34–76
WI	WA9PBW	Madison (2100 Hz)	34–76
WI	WA9WVE	Madison	46–88
WI	W9AIQ	Sturgeon Bay	34–76
CANADA			
BC	VE7ELK	Chilliwack	46–00
BC	VE7CAP	Kimberley–Cranbrook	34–94
BC	VE7BTU	Nelson	46–147.33
BC	VE7AFG	Prince George 58–147.33	
BC	VE7CAQ	Trail	34–94
BC	VE7RPT	Vancouver	34–94
BC	VE7BEL	Victoria	22–147.54
ONT	VE3SAR	Sarina	34–94

Thanks to WB4EAB, WA9TKA, WB6MAY/VE7, WAØRLQ, K6YLQ.

BOSTON HAM AUCTION

Boston College ARC (W1PR) and Middlesex ARC (W1HEB) are jointly sponsoring an auction of radio and ham gear to be held Friday, November 26 at Campion Hall, Boston College, Beacon Street, Newton MA, at 7:00 PM. All area hams are urged to attend, bringing any gear they'd like to sell. There will be a raffle and refreshments will be available.

SEPTEMBER VHF CONTEST

The results of the Honeywell Radio Club (W1DC) effort in the September VHF contest are interesting to mull over. They operated on seven VHF/UHF bands, 50 through 5650 MHz, and made 881 contacts in 29 different sections. The most contacts were made, naturally, on 50 MHz, where they made 432 in 28 sections. Interestingly, 18 of those were on FM, 90 on AM and 324 on sideband and CW! On 144 MHz they made 106 FM contacts, 152 AM, and 107 sideband or CW contacts, for a total of 365 in 21 sections. The best distance on 2m was West Virginia, Virginia and Ohio. Ten contacts were made with Maryland–DC! On 220 MHz no AM was used so there were 17 FM and 18 SSB/CW contacts for 35 total in 13 sections. The 432 MHz results might have been better with some FM, but 31 contacts were made on SSB/CW and 6 on AM, thirteen sections contacted. There were seven contacts on 1296 with 5 sections, the furthest being New Jersey. Four neighboring sections were contacted on 2400 MHz and one on 5650 MHz. Would there be any interest in 73 providing a special certificate of merit for two-way contacts between any two stations on six VHF bands? That sounds like an interesting goal.

DELAWARE QSO PARTY

This contest runs from 2300 GMT Dec. 18 to 2300 GMT Dec. 19. The exchange will be QSO number, report and county (for Delaware stations) or state, province or country for non-Del. stations. Suggested frequencies: CW, 3560, 7060, 14060, 21060, 28060; phone, 3975, 7275, 14325, 21425, 28650; VHF 50.4 and 144 MHz. Novices on 3710 and 7170.

Awards: A certificate will be awarded the highest-scoring station in each state, Canadian Province and foreign country (with 3 or more contacts) and to the highest-scoring station in each Delaware county. In addition, a W-DEL certificate will be sent to any station working all three Delaware counties. Logs showing required date will be accepted in lieu of QSLs. The mailing deadline is Jan. 1, 1972. Send your log to Mark Augustin WA3OYA, 2119 Barr Road, Wilmington, Del. 19808. Persons wishing the W-DEL certificate must apply to this address. No fee asked, but SASE is required.

CINCINNATI STAG

"Without mud it wouldn't be a Cincinnati Hamfest," as one astute observer so aptly phrased it. Nevertheless, quite a number of brave lads from the far corners of Ohio and the nation braved the forbidding muck to set up table and tent in pursuit of an unfrozen buck.

This year's Cincinnati Stag Hamfest boasted an added treat in the person of Bob Mathews, K8TQK, the notorious "voice" of "Miamisburg's Finest Repeater," WA8PLZ. Our enterprising cameraman caught Bob in festive cowboy hat and jovial mood at left in the picture above. This is the last known photograph of Bob, who was last seen sinking rapidly in a plate of roast beef.

At right in the photograph is Miss Floozie O'Toole, an agent of the Women's Liberation Movement, who successfully infiltrated the traditionally all male event by disguising herself as a set of Drake equipment.

. . .WB8LBV

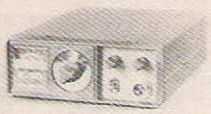
WITH THE FCC

WA3NIL fined $100 for operating on unauthorized frequencies.
WA3OFK proposed revocation of license for not answering FCC mail.
WN4RGR revoked for failure to answer FCC mail and violations.
WA6GMR revoked for failure to answer FCC mail and violations.
WB4KGL proposed revocation of license.

This may seem like a lot, but it is miniscule amid the hundreds of CB fines and revocations.

NEW PRODUCTS

TWO NEW FM TRANSCEIVERS ANNOUNCED



The Icom IC-20 and IC-21, which have been coming back from Japan under the arms of returning servicemen, are now being imported by our old friends at Adirondack Radio in Amsterdam, New York. Both are 10 watt FM two meter transceivers, with the IC-20 having 12 channels and the IC-21 24 channels! In addition there is an accessory vfo for the IC-21 to permit continuous tuning of the receiver. The IC-21 has an S-meter, an SWR meter and even a discriminator meter built in. There is a protection circuit which turns off the final if the output is shorted, open or likely to damage the transistors. The IC-21 operates from either 13.6 volts or 115 V ac. Both use 18 MHz crystals for the transmitters and 15 MHz crystals for the receivers

For further information write to *Adirondack Radio, Box 88, Amsterdam NY 12010* or watch 73 for a review of the IC-21 at an early date.

Automatic Alarm

Whether you have a rig in your car or not you need an alarm these days The estimated life expectancy for a Corvette parked on the streets of New York is now about 17 minutes, average.

The Technical Product Development Company, Box 84, Nutley NJ 07110 has come out with an alarm system for cars which does just about all you could want. For $50 it will set itself automatically and sound your horn, flash lights set off a siren, etc as well as prevent the car from being started if anyone opens a door, hood, trunk, or messes with the ignition. You have seven seconds after opening your car door to turn off the hidden switch to prevent all hell from breaking loose. They have other models for $20, $30 and $40 with progressively fewer features They claim that the gadget is easily and quickly installed.

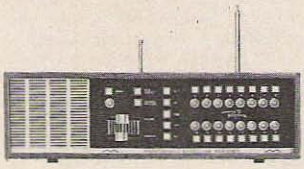
The Immovable Key

How about a key with no paddle movement at all! With no keying contacts, and completely solid state, the Data Engineering key operates by touch alone. The key has two insulated electronic grids which, when touched, operate the ICs. With this system there can be no problems with contact adjustment or bounce since there are no contacts.

The key operates from two C cells and uses two ICs and two transistors. It is carefully shielded against rf. Weighting prevents the key from walking.

How Data Engineering can turn out this remarkable key, with a 5-year guarantee, for only $19.95 is surprising. You can get a spec sheet from them if you write to *Box 1245, Springfield VA 22151.*

16 Channel Scanning Receiver

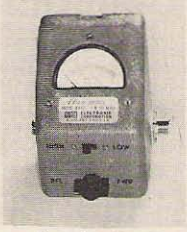


Regency Electronics, 7900 Pendleton Pike, Indianapolis IN 46226 now has a 16-channel scanning receiver available. This covers the 50, 146 and 450 MHz bands, enabling you to monitor repeater channels on all three bands. Push buttons activate the channels you wish to monitor. Manual switching of channels is also possible, naturally. The built-in antennas can be bypassed with outdoor antennas and the built-in speaker can be bypassed if an external one is preferred. Price? $219. This would seem to be an excellent FM scanner for the serious FMers as well as the FM amateur with irons in other fires such as the need to monitor police, Apollo 16, the mafia, or whatever.

TELL OUR ADVERTISERS
YOU SAW IT IN 73!
. . .even if you didn't

New BIRD Ham Wattmeter

Confirming rumors current during the past year, Bird Electronic Corporation has announced the debut of an RF Wattmeter designed especially for the ham market. There are actually three models, two of which cover the 1.8–30 MHz range (160 meter to 10 meter bands) and the third covering 50–150 MHz (6 meter and 2 meter band). The Model 4350 measures forward and reflected power in two ranges: 200W and 2000W, while the Model 4351 has ranges of 200W and 1000W. The Model 4352 has ranges of 40W and 400W covering the two VHF bands of six meters and two meters.



The new line of wattmeters are designated HAM-MATE™, and use the well known Thruline® construction, made famous in the industrial field by the Model 43. The new 4350 Series Wattmeters emphasize dependable rf power measurement, in the tradition of Bird rf wattmeters. Special attention is given to the directivity of the Ham-Mate, which is the ability to differentiate between rf power flowing in opposite directions in a transmission line. The new Ham-Mate has a minimum of 20 dB directivity which assures meaningful reflected power (and vswr measurement).

It is anticipated that the Models 4350 and 4351 will be available for delivery beginning in October 1971, and the Model 4352 in December 1971. All three models are priced at $79 user's net price.

Write *Bird Electronic Corporation, 30303 Aurora Road, Cleveland OH 44139* for further particulars.

NEW NATIONAL TRANSISTOR CATALOG

A new 130-page Transistor Catalog is now available from National Semiconductor Corp. The catalog provides complete data on National's entire transistor line including NPN and PNP small signal transistors, Field Effect Transistors, and Pro-electron types. In addition to specifications, the catalog provides Process No. design/application data and test limit information. A glossary of terms and package outlines are also provided. For a free copy, write to *National Semiconductor Corp., 2900 Semiconductor Drive, Santa Clara CA 95051, Attn: Marketing Services.*

FM TRANSCEIVER RECEIVES ANY 2-METER BAND CHANNEL . . . WITH CRYSTAL CONTROLLED PRECISION

Clegg Division of International Signal & Control Corp. has announced the immediate availabilty of its new completely solid state FM-27 mobile transceiver.

The principal feature of the transceiver is the CRYSTIPLEXER tuner, a new synthesizing system that allows any channel in the 2-meter band (146–147 MHz) to be monitored with crystal precision – but without the need for additional crystals. To monitor any specific frequency within this band, the operator merely sets the two receiver controls to numbers corresponding to the desired frequency. To monitor 146.94, for example, the operator sets the first control to 9, and the second to 4.

Receiver selectivity is rated at 70 dB of adjacent-channel attenuation. Sensitivity is rated at better than 0.35 μV for 20 dB of quieting.

The transmitter portion of the FM-27 is a 10-channel solid state device with a power output of about 20 to 25W of rf.

Weighing less than three pounds, and measuring only 3½" H. x 7-7/8" W. x 9¾" D., the transceiver is packaged in a rugged anti-theft case with a special locking–clamp mounting. Two crystal controlled transmit channels and a PTT microphone are included in the suggested amateur net price of $449.95.

Further information on the FM-27 mobile transceiver is available from *Clegg Division, International Signal & Control Corp., Box 388, R.D.#3, Lititz PA 17543.*

New Hep Catalog

Motorola has just announced their new cross reference guide to their entire line of semiconductors, publication HEP HMA-07 and it includes the type number, basing diagram index, packaging index, specs, maximum and minimum ratings, electrical characteristics, etc. This includes 168 new hobby devices just introduced. Replacements are listed for over 30,000 different semiconductor device numbers including 1N–, 2N–, 3N–, JEDEC numbers, Japanese, Dutch and other foreign numbers. See your Motorola HEP distributor for a free copy of this new catalog.

EDITORIAL BY WAYNE GREEN

Meaningful Contacts

One of the more consistent complaints lodged against our hobby is that so little of our incredible communications capability is used for the exchange of more than superficial information.

Unfortunately the complaint is an all too legitimate one. Considering the reasons why this is so, I wonder if anything can really be done to reverse this pattern? Perhaps a look at some of the more basic reasons will help bring the problems into focus and give us some insight into solutions. Maybe not.

While the resultant lack of any real communication is the common result, there are several causes for this and each has to be considered separately. The chap on the two meter FM repeater has his trade-offs which limit the use he can make of that facility. The DX operator has his problems, some the same, others quite different. The Novice has his miseries, and so it goes.

Perhaps if we start with the more narrowly limiting factors and close in on the generally inhibiting situations we can best outline the whole problem. For instance, the operator working through an FM repeater has a whole bunch of cards stacked against him when it comes to opening up an interesting and meaningful conversation with someone else.

First of all, one or the other is probably driving a car. This means that a good portion of his attention is on the car driving and his radio contact has to take second place in his mind. If there is a second person in the car, this further divides his attention, and you will notice that little of what you say to this chap seems to have gotten across at all. You will be right.

Operating through a repeater could possibly work out well if two ops were putting good signals into the repeater, both had nothing whatever to do except pay attention to the other, both knew that there would be no interruptions, and both had lots of time and knew that they both had the time.

But it doesn't work this way at all. Few repeater users do not have the psychological feeling that they should get off the pot as soon as possible to make way for someone else. One, the other, or both are preoccupied with something else. The signals often fade in and out, losing part of the conversation. One is wideband – the other narrow – and one therefore finds it difficult to understand the other, even when the signal is strong. And so it goes.

Add to this the fundamental difficulty of communicating with a person you don't know, whom you can't see, about whom you know little, if anything, a person you can't even hear except when you stand by for him, cutting off those conversation reinforcing grunts and uh-huhs which help keep two people talking with each other. The restriction of having to talk with no reinforcement, covering everything the other chap has said (as nearly as you can remember) and then originating new things to talk about is a very severe one. It is no wonder that such a large percentage of the radio amateurs stick pretty much to short recitations of their equipment and the weather.

The amateur radio type of contact is quite abnormal and has no counterpart in our learning process, so most of us are unprepared to tackle the difficulties it poses. Even on the telephone you can hear the reinforcing noises of agreement and be stopped when the other person has something to add or disagree about. Way back in the long-dead past of amateur radio this type of communication did develop for a while. Oldtimers will remember with great warmth the duplex contacts on 160 meters where it was possible to just leave your rig turned on and tune in to your contact on the other end of the band. Just like the telephone.

When sideband started and VOX became the way to go, this system looked as if it would partially bring back the old arrangement. But the clank of the relays was too much for most operators and, after uh-huhing between sentences to keep that conflabbed VOX from tripping, they went back en masse to push-to-talk.

While a few of the DX brethren do indulge in interesting contacts, most of the exchanges are of little more value to anyone than the hasty hello over the local two meter repeater. The pressures of other stations trying to work your rare one, fading, other contacts on frequency, and such jazz make long contacts rare. Even if you have the ability and experience to manage an interesting contact you would be hard put to bring it off.

I would dearly love to talk with YA1GNT for an hour, yet I have one devil of a time carrying on an hour contact with Chicago a good deal of the time. Oh, I can make it now and then, but I have to lose a lot of sleep waiting for the right conditions.

Are there any answers to the problem? Are there any changes that might be made so more or us could indulge in meaningful conversations via our incredible amateur radio bands? I think so.

There are no simple answers to such a complex set of problems, obviously. But we can all help out if we are first of all aware of what we are missing and make a determined effort to move in the direction of better use of our bands.

On the FM repeaters I would suggest that repeater owners seriously consider the installation of a second or third repeater. While the spectrum between 146–147 MHz is about full in many areas, there is still little going on in the 145–146 and the 147–148 bands. The emerging 220 units will make that band an invaluable addition to the two meter repeater setup. With enough repeaters we can afford the luxury of long-winded contacts. With both 146 and 220 repeaters we might even develop a duplex system of operating. The use of two- or three-minute timers on repeaters will aid the mobile operator in getting a word in when two long-winded ops are talking. Timers like that will also shorten some of the endless and pointless pontifications which drive ops off the air for weeks at a time when they get snagged.

I'd be very interested in what you, the reader, thinks might improve our ability to use amateur radio for true communication. Should phone patches be eliminated except for serious emergencies? Should nets be curtailed or encouraged? Should DX for QSL card purposes be channeled to a small set of frequencies? What *can* we do? Here we are, able to talk anywhere in the world, and what do we do?

When you consider that we have virtually the ONLY system for people-to-people contact around the world, perhaps you can appreciate the importance of our really making something of it. Tourists rarely get to meet the people in a country they are visiting. They meet the tour guides, hotel clerks, and taxi drivers, and that is about it. No wonder so many Europeans have incredibly distorted ideas of Americans . . . they know us from our movies and television ex-

ports, and an occasional camera-clad tourist who bumped into them on the street. How much do you know of Yugoslav people . . . their lives, interests, foods? Yet I doubt if any serious DXers have talked with less than a hundred YU stations.

What can we do? I think all of us are open for suggestions and ideas.

SAROC

A reader wrote to ask what it is about Saroc that we make such a fuss over it. Mostly I guess it is because this is one of the best run and most carefully planned hamfests in the country. I know I have a wonderful time there because I can get together with the amateurs who are making the news and the manufacturers with the newest products.

Like you, I'm interested in seeing and feeling the latest ham gear, whether it be FM, SSTV, or sideband. I enjoy talking with the men who design and make this equipment . . . to find out what they have in mind for the future . . . what problems they've had . . . how things are selling. I like to pass along reader questions about difficulties with the equipment and my own personal miseries that I may have had.

The 34–94 repeater allows me to talk the clock around with interesting FMers and meet the fellows who are designing the most sophisticated repeater installations.

The technical talks are usually fascinating and give me a lot to think (and write) about. The parties are even more fun, whether it be mass elbow bumps put on by manufacturers or bashes in the private rooms in the evenings.

The $12 per double room at the hotel makes the visit relatively inexpensive as long as I stay clear of the gambling tables and devices. The expensive shops are a delight to look into if I am there alone, and a caution if my wife is along.

It's fun . . . and that is what amateur radio is all about, right?

Articles wanted...

Come on you fellows who are working with ICs, break loose with more articles for the rest of us. We know you can make up a frequency synthesizer now that will let the Novice use crystal control and still hit every kHz or even 0.1 kHz across the Novice band. We know you have worked out many ways to replace the dozens of crystals needed to hit all those FM repeaters with a synthesizer for the receiver and transmitter. We know you have some fabulous new RTTY converters and AFSK generators. We know you can build 24-hour clocks for the shack that count the Hertz arriving from Con-Ed and wink at us with numbers. We know you can varactor yourself up through any of the UHF bands with substantial power. What we don't know is if you can write about these modern wonders.

You say you have a mini-repeater in your car so you can work through the local repeaters even with a hand unit? Details . . . give us details. You are proud of your remote base up on that mountain, complete with sophisticated controls . . . write about it so more of us can join the fun. You have a Touchtone system that is unusual? Let's go!

Status Quo of CB

The 1970 FCC annual report disclosed that a total of 886,951 stations were licensed to operate in the Citizens Band. During the year 26,327 new stations were added while but 951 were dropped. Perhaps that will put to rest some of the exaggerated reports circulating citing over a million CBers. That growth figure sure would look good in the amateur service, wouldn't it!

Scaling as a Way of Life

Several months ago we built up one of Heath's counters and it has seldom been turned off since its first test run. Normally it sat on top of the sideband rig, reading out the frequency a la the Signal One . . . "Hmmm, let's see there, Gus, I think I'm on about fourteen point two one eight three seven seven, how's that check with your receiver dial?" Heh, heh!

All this was a barrel of laughs, but it didn't help much with the mysteries of what is tuned where on two meters since this was a good bit above the range of the IB-101. And two, as you may have read, is where it's at these days. Particularly around here at the 73 pad, it's at.

Chancing to read one of the fascinating ads in 73 (I find the ads in 73 much more interesting than those in other magazines, don't you?), I noticed that Vanguard Labs was making a nifty little contraption designed to solve my problems. A Scaler. This gadget divides things by ten, which is just the ticket for counting down from 146 MHz.

Down in my cellar workshop I have one of the world's nicest old frequency meters, the Navy LR-1. This kluge weighs in a 98 pounds of hernia-inducing bulk and has about fifty tubes. It was built by General Radio, so you know it was the state of the art back when. The LR-1 has done well for me down through the years, I have to admit. With it I could read out most frequencies to a cycle or two if I made a project out of it. That's almost as good as the IB-101, which feels like it weighs about six ounces.

At any rate, today I have the IB-101 and the Vanguard Scaler on the desk and with them I can get the FM transceivers right exactly on channel instantly. I poke the prod over near the receiver oscillator and read out the 136 MHz frequency there (146.94 – 10.7 (i-f) = 136.24 MHz). A quick tweak and it's on channel. Then I probe near the coax output and tune up the transmitter. With the counter on the Hz position it counts in tens of cycles, which is closer than your quivering hand can probably adjust the trimmers. While it varies from rig to rig, I've found that several of them drop about 500 Hz when I put them back in the case. Now I know and you know that one half a kHz isn't going to make the slightest difference to anyone, but perfection is perfection and we have the means, so why not be perfect? Right, so we tune everything up a bit high and it all drops into place back in the box. For a while.

Quite a few FM rigs come and go here, so the counter is in use almost every day. And of course, every time I am going to take a trip anywhere I have to get out my tray of crystals (I'll sure be glad when frequency synthesis is the order of the day) and re-crystal for the new area. In go the crystals and tweak, tweak, they are on channel, and I'm off to New York City or Chicago, ready to join the fun wherever I am.

Just going up on the local mountain, Pack Monadnock (where we keep the WA1KGO repeater), calls for a good deal of encrystalization. If you are on the go you could do worse than drive to the top of this lump, the highest place you can drive in Southern New Hampshire. From there you can work through so many repeaters it will make your head spin . . . W1ALE, WA1KGR, W1KOO, WA1NJR, K1MNS, WA1KGO, WA1KGP, W1ABI, WA1KFZ, WA1KGM, WA1IMO, W1QFD, WA1KRJ, WA1KFX, K1ZAW, K1ABR, WA1NEU, W1MTV, W1PRI, K2AE, WA2UYJ, and perhaps a few more if you wait for the squelch tails to stop and if too many fellows aren't on channel using closer repeaters.

Impressing Relatives

Or friends, for that matter. What amateur hasn't had to try and explain the hobby to some long-lost visiting aunt or cousin? It is difficult. They look puzzled and not very interested. Our hobby is a damned impressive one to us and we want them to appreciate what miracles we accomplish. The usual scene following the attempts to explain is one of demonstration . . . and it is frequently a disaster, leaving the aunt convinced her nephew is an idiot.

(Continued on page 10)

W2NSD/1 *(Cont. from page 9)*

The chap with a DX-20 on CW has no chance and he knows it, so (unless he really *is* an idiot) he flips through a few choice QSL cards to prove his prowess and lets it go at that. The seasoned DXer may put his reputation on the line by turning on twenty meters and tuning for something better than average. I've tackled this with success at times, netting an interesting contact with an ornithologist in Finland on one important occasion.

The other day I was worried and I admit it. It was during my folks' wedding anniversary celebration up in northern New Hampshire and all I had with me was a little two meter Handie-talkie. There I was, sitting in the back seat of someone else's car trying to explain amateur radio to an aunt I hadn't seen in twenty years. I talked about working DX and then got into describing repeaters. She heard what I was saying, but it obviously wasn't making much sense.

I pulled the little HT-220 out of my jacket pocket and turned it on . . . silence. Hmmm, not so good. We were driving through the White Mountains about 50 miles from W1KOO in northern Vermont . . . could I make it? I flicked the button and the squelch-tail came back on cue. I announced myself on channel and hoped. Back came a VE2 mobile in Montreal! We talked for about five minutes and the effect was most positive. She *was* impressed. So was I, to be truthful. I wasn't at all sure I would be able to get through from the back seat of a car with a little two watt Handie-talkie over that difficult path. Needless to say I rested on my inflated laurels and didn't go on to prove that the contact was a fluke that might be difficult to repeat.

Thin 73 This Month?

We appear to have been taken to the cleaners by three of our trusted Massachusetts advertisers to the tune of an amount about equal to two complete issues of 73. This is not only frustrating since they ignored our suggestions for improving their advertising, but we bent over backwards to help them and got nothing for our efforts. We will have to cut back a little on the thickness of 73 for a month or two to make up for this royal rip-off.

. . .Wayne

HELP STAMP OUT
MENTAL HEALTH
SUBSCRIBE TO 73
NOW

LETTERS

ou goons don't ever proofr
b
n
I insist that you print ev

The VU9KV DXpedition was organized by me in April (12th to 21st) and I was at Port Blair in Andaman Islands for 225 hours. During this time I must have been QRV for approximately 170 hours allowing for sleep(?) times, mealtimes and the times when the power was off or voltage too low (160) for the relay to operate (Surprisingly the FTDX works at even such low voltages as long as it is upside down and I have a pencil to push the relay!). During that period I made 4661 contacts mostly on 10, 15 and 20 meters. Had just a few contacts on 40 and 80 meters. Conditions were extremely poor, but I was glad that I was able to perform better than the other expedition that was being operated at the same time. Fortunately the band conditions were not too good during some part of the daytime and we were able to see some of the picturesque countryside and take some pictures. The XYL was also there for moral support and enjoyed the holiday. The QSL business was very ably handled by Clyde W6KNH.

Venkat VU9KV
New Delhi

I just received my copy of October 73 and was surprised that you published the article on page 79 by WA1FBH entitled "Back to mother earth the easy way." I have seen this type of article many times in the past, and if you only wanted to get the pipe into the ground this is okay, but if a good earth ground is what you want, then this is about the poorest one you could get.

No doubt the article was written in good faith, but you will find if the pipe is say ½ inch in diameter that you will end up with a hole in the ground about 1 inch or more in diameter and the pipe swinging in this only making contact a few inches at the bottom.

I have been an electrical worker all my adult life and in our work a good earth ground is often important. If you wish to test your ground take the YXL's electric iron and your ac meter (accuracy here doesn't matter so much) plug the meter into a duplex outlet and read the voltage, then plug the electric iron in the other of the outlets on the duplex outlet, read the voltage and make a note of the drop in voltage.

Now take a couple of pieces of wire (number 14 or larger) long enough for one to go to your ground rod, the other long enough to reach an ac outlet. Put a duplex outlet on these two wires, fasten the one wire securely to the ground rod, then plug the other wire into the "HOT" side of the duplex outlet furnishing the current. Now use the duplex outlet you put on the two wires and make the same test as above using the ac meter and the electric iron.

If you get as many as two times as many volts drop in this last test as the first, you have a very poor ground.

Harold D. Mohr K8ZHZ
Gahanna OH

Have been waiting some time to read in the letters column something about the cover on the July issue of 73. Noticed a letter from a Texas ham offering to send you a Texas plate. I felt sure, by now, that someone would question the W6 plate from the state of Tenn. which I believe is the fourth call area, also holding fourth in a prominent position on the front cover of July 73. Anyway: Love your mag: read each copy over several times, even read the ads. Someday, please, how about some articles ABOUT FAST SCAN TV?

Harry E. Neff W9UBF
Anderson IN

Out of call area plates are particularly treasured. Though I am not a license plate collector, other than call plates, I do want to thank everyone who has kindly sent me plates. We will be metalling the barn wall with them . . . and hope someday to have enough for another picture. ATV? Come on fellows, let's see some articles on using the new ICs for TV.

Your magazine has gone VHF and I am not interested in the high meter bands. I do, however, like the books on the lower bands as those are the ones I work. The VHF equipment costs, the lack of range, the lack of CW, the FM, etc., just do not appeal to me.

Thomas Piepenbrink WA9SRB
Fort Wayne IN

Tom, what does it take to please you? In looking over the last few issues, in August there was not one single VHF article. In September there was ONE VHF article. In October there were only THREE! Now that comes to a total of four out of 47 articles, or less than 10%. Is it possible *to please you? Being honest, it must be admitted that we have been underplaying FM and VHF a little for the last few months to bring the magazine back into balance and that the per-*

centage of VHF will most certainly be higher in the coming months than it has been recently. Tom, you could do a lot worse than visit your local distributor and just listen in to the activity on the Fort Wayne repeater. Hundreds of amateurs are having the time of their lives with this, so don't sell it short . . . particularly without even looking into it. It does NOT have to be expensive at all. I like the low bands and would never give up my low band fun . . . but I am having a fantastic time on FM and I feel deep regret when I am unable to even get someone to try *something that I find so much fun.*

In the last few issues of 73, and in numerous issues of other ham publications, there has always been reference to the CB problem. We all know there IS a problem, and it is, in my opinion, definitely a threat to the existence of amateur radio, at least as we know it today.

I work for an electronics retail outlet, handling CB radio, along with stereo equipment, here in Dover, Delaware, and therefore am in daily contact with the CB world. For this reason I feel somewhat qualified to discuss them.

Needless to say, I am 100% against relinquishing any amateur band for use as a CB band. It happened once before, and anyone who cares to take the time to look, can see it was one tremendous mistake on the part of the FCC. It did not result in more hams, more legal CBers, or any other benefits to anyone but the electronics manufacturers. How can anyone, especially anyone who ever listens on the CB band, suggest that to give the CBers a legal "hobby license" is going to improve their operations, or is going to result in anything but double jeopardy?

I notice in literature from Antenna Specialists, they push the EIA proposal to allocate 146–148 MHz to CB hobby operations. While this newsletter is not up-to-date on the 220 Mgz proposals, it certianly shows where the amateur stands in relation to large antenna manufacturers. Shall we create even more of a market for CB equipment, further forcing the prices and availability of amateur gear out of our reach?

Here in this area the tremendous amount of illegal operation amazes me. I know of several companies using CB radio legitimately, say, five or six. The balance of the local CBers seem to have no idea of the content of the regulations, let alone have the desire to follow them. Thisincludes the local REACT operation, with which I am familiar. I know personally several "good citizens" of the REACT, running linears, 40 foot towers, etc., in REACT operations. They say they have to have the linears in order to get through in times of emergency. Possibly true, but comparable to my stating I have to drive 60 miles an hour in order to get through the local residential areas in self-defense, because a few others are. Bull. I sincerely doubt I could find 20 people in the Dover area who use CB radio as intended. How many are in the area? I don't know, but from my store window I can see 5 CB ground planes in one housing area of about 30 houses.

A week ago, a customer asked me for an rf wattmeter. I said sure, we had a real nice one, good for up to 15 watts. He laughed, saying he needed one to read 3000 (yes, three thousand) watts. Another wishes to trade his 300 watt (output) linear on a high-power one. They don't like our standard line of antennas, because they arc and melt at over 500 watts of rf. If this was the kind of customer I got once a month, or even once a week, I would be impressed with the integrity of CB radio, for I know of a few hams also running, 5, 10 or more kW. But this is the kind of customer I get once or twice a day on a slow day, and more often on busier days.

What is the solution? Can the FCC move CB to VHF where it belongs? I doubt it. Many do not have licenses, 98% do not use them (they just use pseudonyms – Poptart, Dumbell, Sandbox), and would pay zero attention to any FCC ruling saying "Ok, boys, be good and move up to VHF." Therefore, a reallocation of CB to VHF would result in two Citizens Bands, one legally allocated on VHF (but probably illegally used) and the other illegally retained by the ones who don't give a darn.

One solution would be to move them, and immediately reallocate 11 meters to international broadcasting, military point-to-point wideband multiplex, facsimile, multikilowatt AFSK, etc.

Another solution, one which might in the long run benefit amateur radio would be for special permission from the FCC for technically qualified amateurs, preferably holders of high class amateur *and* commercial tickets, possibly retired, who have the equipment, to act as volunteer monitors for the FCC. As most of us are aware if we sit and tape a conversation on CB and send it to the FCC, it is not admissable as evidence. But, for this special group of amateurs who wish to see amateur radio continue, they would be acting as official FCC monitors, on a voluntary, non-paying basis, and tapes and other evidence made by them would be acceptable to Federal authorities. This would cost the FCC nothing (one of their hang-ups), would multiply their monitoring manpower and efficiency tremendously (again at no cost) and would increase the chances of survival for amateur radio.

I would invite comments on this second solution, as to whether it would seem feasible to the majority of concerned amateurs, and be worthy of drafting into a formal proposal to the FCC. If worthy, I would gladly relinquish any "copyright" and hope someone with the knowledge of legality and formal governmentese would draft and submit it.

I know of a couple of amateurs in the Dover area who would qualify (and I am not one as I do not have a commercial license), so I am sure there must be many in larger areas.

Opinons?

Ed Brooks Jr. W3GAB
Felton DE

The choice on 220, as I see it, is either you lose a good part of it to CB per the EIA proposals or else you share part of it with a hobby licensee. Which would you prefer, complete loss or sharing? I see no parallel between possible 220 use and the mess on 11 caused by skip operating and regulations which make almost every operator illegal. But, it's your choice . . . which do you like best?

Dear Wishy Washy Wayne Green,

Anybody who prints the pages right instead of sideways can't be all bad! Let's get those other improvements implemented. 2m FM? Why? It's expensive, you get only one band, coverage is limited, you can't get anyone to talk to you on repeaters, costs a bunch to put up your own repeater, and try and use someone else's repeater while mobile.

XX

The above letter arrived unsigned, but I know who it's from . . . the postmark gave him away. The postmark was "Northern Virginia." How about that? *What else but your favorite and mine, the CIA? Who else could have such a ridiculously ambiguous address. And who in the CIA but an old ham-Mensa buddy of mine named Brad would write such complete hogwash? Lordy, when you can buy a brand new transceiver for under two bills (like the Drake TR-22) and have an absolute ball, or even go the used Motorola route for less, they sure must not be paying much to the CIA agents these days. With his crummy attitude I don't doubt for a minute that the fellows in Washington across the river there won't let him into their repeaters. Good going, men, keep those cloak and daggerers in their compound and let them put up their own repeater with a super secret tone burst entry. Considering the crowds on 2m FM these days, who needs another band? I have all I can do to keep up with the FM scene. Oh, I come down for some choice DX now and then on 20m, but the excitement is on 2.*

73 is usually several months ahead of local info on the IC scene.

We have in operation at the moment a repeater on Mt. Tambourine with an input of 146.1 and output of 145.6. This gives us coverage of Brisbane and the Gold Coast extending into northern VK2.

146.0 is our main working frequency for simplex.

Graham Nixon VK4ZZG
Brisbane, Australia

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WANTED: Book "Practical Wireless Telegraphy" by Elmer Bucher (1917). Advise condition and price. Hugh Compton W7MKW, 205 S.W. 102nd St., Seattle WA 98146.

2-METER MOTOROLA P33-BAM HANDI-TALKIE, excellent condx, with nicads, Motorola charger, 12V cable, manuals, antennas, $150. Gary Goldberg WA2FAS, 4016 Coachmen East Apts., Lindenwold, N.J. 08021.

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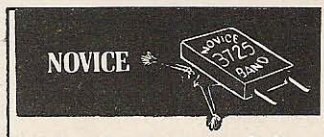


Code Practice, Western Style

Don Johnson W6QIE sends code nightly except Monday on 3590 kHz at 8 pm local time, starting with 15 minutes of wpm, then 10 minutes each at 8, 11, 14, 17, 20, 25, and 30 wpm. Thanks to *Active Keys*, NPEC bulletin.

Novice Courses

The course being given by Bill Welsh W6DDB in Burbank has recently produced 27 Novices, most of them already on the air. The next course will start 5 June and run for 10 weeks. This is a tremendous course and well worth while. Write to LERC, Lockheed, Burbank CA 91504 with SASE for more data. Their General Class course will start 10 January and run for 18 weeks. The present class has 40 in attendance. These courses are open to anyone.

David Morgan K6DDO
4747 Ambrose
Hollywood CA 90027

Convert Your 7 MHz Cubical Quad To All Bands

Why let your quad limit you to one band? This is one antenna that can be adapted to multiband operation.

160 Meters

Let's start with 160 meters, since nobody ever heard of a rotatable quad on that band. Theoretically, it should be quite feasible to put the quad on 160. It would be likely to even have 2 to 4 dB of forward gain. Once you have built the large supporting structure it would be very easy to try 160. Here is how to do it. The boom length on the quad is 30 ft or so. On 7 MHz the boom length is about 0.22 wavelength. On 3.5, this would give about 0.1 wavelength spacing and on 1.8 about 0.05 wavelength spacing. At this spacing the antenna will be very sharp in frequency response and should be tuned to a spot frequency. However, it will still work and should display considerable advantage over the usual arrays. Generally about 0.1 wavelength is commonly used in close-spaced arrays.

For loading purposes, four coils of 3 or 4 in. diameter with about 4 to 6 windings per inch should be inserted in the center of the tops and bottoms of the element. (See Fig. 1.) The coils can be tapped and adjusted to tune the elements. The coil at the top of the element should be the same length as the one at the bottom. This will prevent imbalance.

The gamma match might be 15 to 20 ft long on 1.8 MHz; thus, the coils will have to be placed down toward the tips of the bottom wire. This can be worked out experimentally. The rule is to use the same number of turns on each of the two coils as close as you can get it. Also they must be the same distance from the center of the element. As you add one turn on the left coil, add one turn on the right coil and two

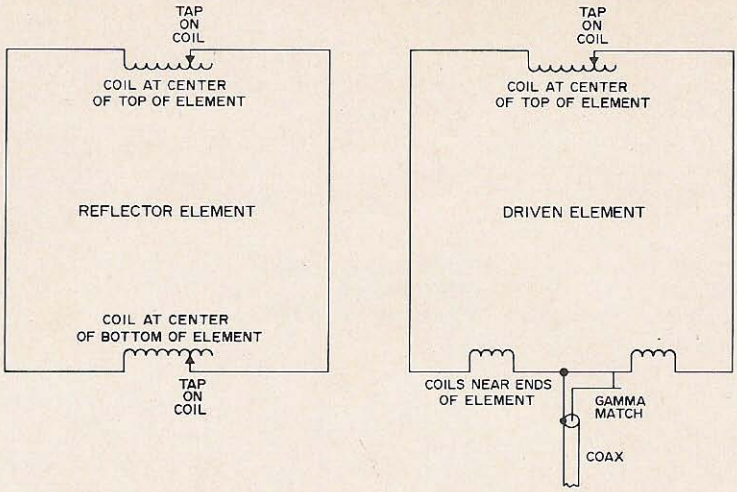


Fig. 1. Quad configuration, reflector and driven element.

turns on the coil at the top of the element. This way the array will stay in balance. There are other ways to accomplish the loading, but this is presented to give you the idea rather than an ultimate solution. Use a gamma match to feed the array. The electrical length of the reflector will probably be about 1.05 times that of the driven element. To tune the antenna first adjust the driven element coils and gamma to resonance at the desired frequency and then adjust the reflector coils for maximum gain or maximum front-to-back ratio.

80 Meters

If you can build a 160m quad then 80 should be easy. It is only a matter of loading. Use the coil system described for 160 but with less turns. The coils for 80 and 160 should be of rather heavy wire and widely spaced to prevent arcing under power. Long coils will be better and the diameter should be as large as convenient. The gamma match may come out around 10 ft long. The spacing of 0.1 wavelength is quite standard and will give excellent results.

20 Meters

From looking at the photographs of the original quad from which the multiband one was derived (73, May 1967, pp 26-31), you will see that the boom has four spiders on it. It is a simple matter to add four more pieces of element and have the entire support system for a 4 element 20m quad. The standard procedures can be used with standard measurements.

An alternative method to the standard 14 MHz quad is to add arms on the two spare spiders in the center of the boom and build a 4 element extended quad antenna.

Some of you are familiar with the K6CT crossed yagis. What George discovered was that you could mount two multielement yagis on one boom at right angles to each other and get a diversity effect and enhanced gain. Now you will notice that in the 7 MHz quad article previously referenced there is about 30 to 36 ft of aluminum in the center of each of the quad element supports. These are actually parts of 4 element beams for 14 MHz. The inner two elements can easily be added to effectively yield considerable gain. There should be virtually no interaction with the 7 MHz elements. To build it, just add a driven element in the center and another parasitic element. The spacing of about 7 ft between elements is about 0.1 wavelengths.

15 Meters

The 15m band is easy. Use the inner

spiders and build a 4 el quad. The spacing is wider than 14 MHz but still quite workable. You could also put in some 15m yagis. You could also build an 8-element quad on 15 in the configuration shown in Fig. 2.

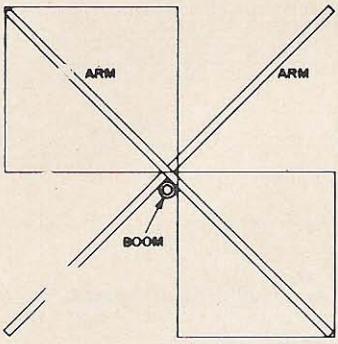


Fig. 2. Cross section of one spider and elements.

10 Meters

After all this you should have lots of ideas for 10. You can use any of the preceding and in addition you might try a quad-quad. This would give 16 elements or 28 elements with no more supporting structure than already described. A cross section of one spider is shown in Fig. 3. If you use four spiders like this you will have a total of 16 elements. However, on 10 meters the quad will have 0.2 wavelength spacing, which is sort of wide; this permits you to add three more elements between the existing four. There is no need to add more spiders because if you are clever you can hang the extra ones on nylon cord in between, taking care to get the spacing right and avoid wind movement. This 28 element quad on 28 MHz would really put out a signal.

The cross arms are not actually needed as the elements can be tied back with nylon cord.

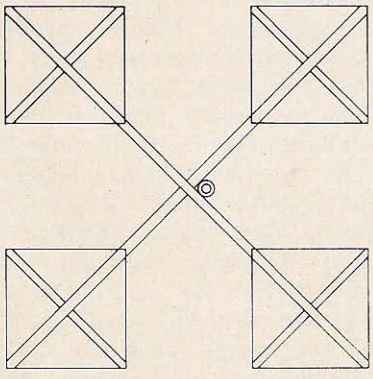


Fig. 3. The 28 MHz quad-quad.

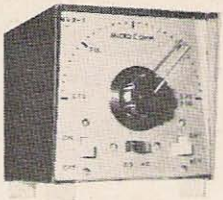
All Bands

What is a simpler way to put all bands on the quad? The methods mentioned work best for high gain on one or two bands since the elements get in the way of each other if you try to add too many fancy arrays. For all bands it would be advisable to use straight quads on 28, 21, 14, and 7 MHz with four elements on the three higher bands and two elements on 7. 3.5 and 1.8 would be connected electrically by switching a relay.

Here is another idea for all bands. Suppose you buy two very strong oversize triband beams with sturdy elements. Then you mount them on the 4 in. boom and extend the tips of the four end elements with fiber glass or bamboo to 54 ft each. Hang your quad wires on for the lower frequencies and you will be ready to go. You would have a K6CT design for 14, 21, and 28 and a quad on 7. It might be necessary to build your own tribander to do this, since the commercial ones would not be sturdy enough. You can still add the coils for 1.8 and 3.5. What would be more practical on 3.5 and 1.8 would be to use traps in the quad elements and a multiband gamma with three gamma matches in parallel to cover all three bands. If you were to get a set of those traps used in trap dipoles you could probably work it out – maybe adding a few more coils as needed, here and there.

Switching

One of the ways to handle the feedline and switching problem is to use a stepping relay such as used on TV antennas. I took one of these and rebuilt it with coax leads inside it and it has worked out well on control switching of quad feedlines. One line runs to the shack. The relay has four positions and there are four feedlines pos-



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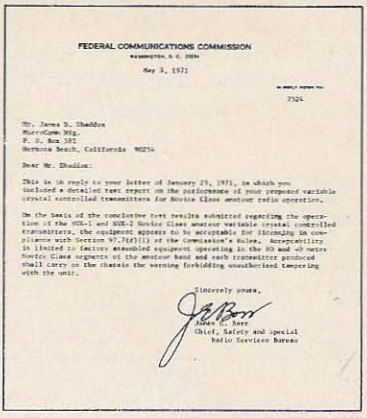

FEDERAL COMMUNICATIONS COMMISSION

May 3, 1971

7524

Mr. James D. Sheddon
MicroComm Mfg.
P. O. Box 585
Hermosa Beach, California 90254

Dear Mr. Sheddon:

This is in reply to your letter of January 29, 1971, in which you included a detailed test report on the performance of your proposed variable crystal controlled transmitters for Novice Class amateur radio operation.

On the basis of the conclusive test results submitted regarding the operation of the NVX-1 and NVX-2 Novice Class amateur variable crystal controlled transmitters, the equipment appears to be acceptable for licensing in compliance with Section 97.7(f)(1) of the Commission's Rules. Acceptability is limited to factory assembled equipment operating in the 80 and 40 meter Novice Class segments of the amateur band and each transmitter produced shall carry on the chassis the warning forbidding unauthorized tampering with the unit.

Sincerely yours,

James D. Barr
Chief, Safety and Special
Radio Services Bureau

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sible to different antennas. Quite often the feedline of a second band can be ignored or phased out and a short length can be left in place with a relay 10 or 20 feet away. This is a matter for experiment with regard to the 3.5 and 1.8 MHz coils. The trap system might be the best for these low bands but what set of traps and coils to use if you try it is left to experiment. The point is that unwanted things can be disconnected with traps.

Feeding

Feeding a group of these antennas may be a problem. The standard types of matches will work well. But if you want to drive both a quad and a yagi on the same boom and same band this may be a situation requiring some thought to get the right impedances and good power transfer. I have found that gamma matches give the best feed for quads although many people don't use them. The idea of using coax baluns and calculated impedances does not give precise matching due to the reflections of nearby objects. It does work as a first approximation. The more bands and elements you add to the array the more important it is that you can tune and measure every part of the antenna.

Conclusion

What I have done is to give you some ideas that I hope will enable you to come up with some more interesting antennas and better use of a large supporting framework. The final method has not been described for there must be something left for experiment or we would not be doing much as amateurs. There are endless possibilities to getting more gain out of antennas and in a recent conversation with a professional antenna design engineer he told me that they could use some better ideas for the space tracking program. One of the important unsettled questions is how many arrays can actually be gotten to work on a design such as we have. Can you somehow cheat and squeeze in a few more elements and still raise the gain some more? Most people think you can't but they are the source of a new frontier.

. . .K6DDO■

The Indoor Quad

Ray Kasprzak K9RJO
4958 West Potomac Ave.
Chicago IL 60651

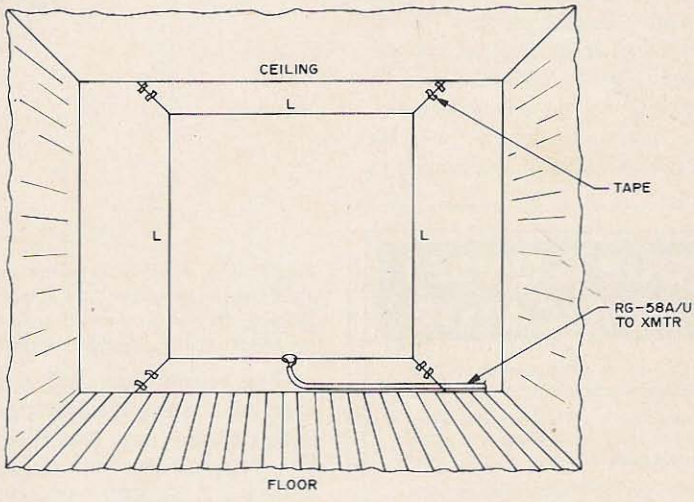

Fig. 1. Tie string at the corners and then tape to ceiling and floor. L = approx 251/f(MHz). I wound up with 8 ft 2 in. for each side after trimming for minimum swr.

After spending several hours on 15m with everyone telling me of the excellent openings on 10m, I decided to see if I could get some rf out on that band.

Being an apartment dweller, and having spent the entire summer erecting an inverted vee on the roof, I had my doubts as to whether or not my landlord would look kindly on my spending the winter putting up another antenna. (I would undoubtedly be seeking permission to erect an antenna on top of the local Salvation Army Hotel had I made another trip to the roof.)

That's when I decided to try an antenna inside the shack. First I thought of trying a dipole, but since a dipole doesn't really do much for my low-power signal even when the dipole is outside, I dismissed it. My next idea was a quad and looking around the shack I found that my ceiling was 8½ ft

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Many other kits, parts and plans available including starter kits, focus/defl. coils, vidicon tubes, const. plans, etc.

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high. Using the standard formula L=251/f, I made the driven element as shown in Fig. 1. I used string tied at the corners and taped the element to the ceiling and floor with the whole thing about 4 in. from the wall. Next, I made a similar element for the reflector and placed it 6½ ft opposite the driven elemenet (Fig. 2). I hooked up a 10 ft length of RG-58 to the driven element, and found I had an swr of 3:1. By trimming the driven element, I managed to reduce this to 1.4:1. It's easy to keep the sides symmetrical by slipping the wire through the string. The string can be taped in place after trimming the antenna.

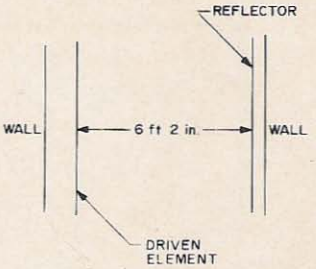

Fig. 2. The distance between the 2 walls of my shack was very close to the distance for optimum spacing. If you have room, you may experiment by trying various distances between elements.

The results were just a little short of amazing. During the first operating session with this antenna, I worked LUs, an HC, PY, 9Y4, XE and VE8. Signal reports were anything from S6 to S9+. I also worked a dozen W6s. Almost everyone said the band was on the poor side, and my signal compared favorably with others from the same area. The rig used was an HW-100.

The reflector is tuned to a frequency lower than that of the driven element. If you choose to have a director rather than a reflector, you should tune the element to a higher frequency than that of the driven element.

When switching from my inverted vee to the indoor quad, there is a 2 S-unit increase on the quad in all directions.

Incidentally, my operating position is right between the elements of the antenna.

. . .K9RJO■

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Getting to know

TEE SQUARED ELL

The early RTL families of logic integrated circuits have been utilized for many ham-type circuits encompassing everything from rf amplifiers, oscillators, and other linear-type circuits to digital circuits for which they were originally intended. However, the commercial/industrial demand for RTL circuits has been on the downhill slide for the past few years so the availability, price, etc. are not as attractive as they have been; moreover, no new and exotic circuits have been added to the RTL families. But don't despair – get HEP with TTL, because this is where the computer industry demand is. And when you have big demand, you have high volume production which means low prices. In addition, you can do everything and a little bit more with TTL that you could do with RTL – and you can do it better, because TTL has much higher frequency capabilities. In fact, TTL is the fastest form of saturated logic made. MECL circuits which operate at higher frequencies are nonsaturating devices.

The basic gate of all TTL families is the *nand* gate; this is because all logic functions can be synthesized with only *nand* gates. A typical TTL gate circuit is shown in Fig. 1, and the typical transfer characteristic (input vs output voltage) is shown in Fig. 2. When all inputs are logic 0, the output is a logic 1. When all inputs are a logic 1 the output goes to a logic 0. Note, however, that the device goes through a linear region as it makes its transition from logic 1 to 0. By biasing gates in this linear region they can be used for amplifiers and other nondigital applications.

Notice from Fig. 2 that the permissible input voltage range for a logic 1 output is only a few tenths of a volt. This makes TTL a little more sensitive to stray voltages (noise) than RTL. It is possible that with power applied (pins 14 and 7) and with pins 1 and 2 open (or any of the other gate inputs) that pin 3 would *not* provide a logic 1 output (it would be at 0) because of stray voltage pickup. Grounding both gate inputs immediately produces a logic 1 output. So, don't attempt to use TTL gates with the inputs left open or you will have problems. In normal operation, the gates would be connected to another device which would provide the permissible input levels.

Basic Functions Using *Nand* Gates

Since we indicated before that the *nand* gate is the universal logic element of the TTL family, let's start out by showing how six basic Boolean functions can be implemented with *nand* gates. These are shown in Fig. 3. Some additional basic applications for *nand* gates driving discrete devices are shown in Fig. 4. Several of these circuits use the HEP-C3001P which is a slight variation from the basic *nand* gate in that it has open collectors which permits increased versatility. See Fig. 5. Note that the output transistor's collector must be connected to V_{cc} through a resistor, bulb, etc. As shown in Fig. 4, the open collector gate is ideal for driving SCRs, the new light-emitting diodes, and low-voltage, low-current incandescent bulbs. These last two items are often used as readouts in frequency counters.

Note: In all of the circuits shown, the V_{cc} and ground connections (pins 14 and 7) are omitted to simplify circuitry.

Pulse Shaping and Generating

Pulse shaping involves forming a train of square waves from any periodic wave. If the original waveform is relatively fast, 1 kHz or faster, the circuit of Fig. 6 can be

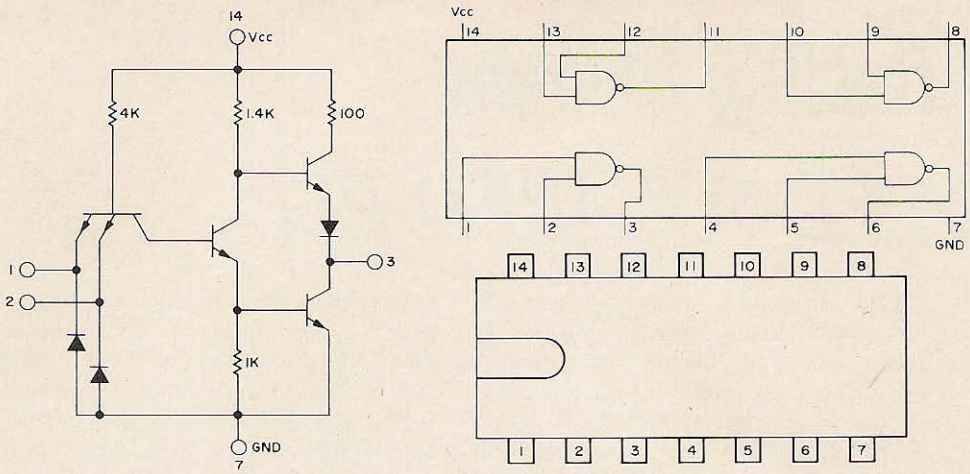


Fig. 1. Typical TTL gate (¼ of HEP-C3000P.

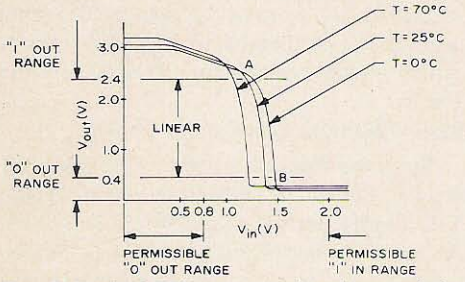


Fig. 2. Typical TTL gate transfer characteristics.

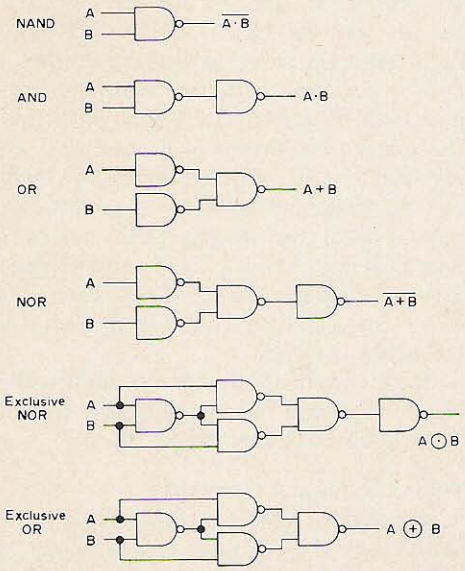


Fig. 3. Six basic Boolean functions as implemented with a NAND *gate.*

used to provide good square waves. Slower waveforms need the regenerative Schmitt trigger shown in Fig. 7. The accompanying table in Fig. 7 shows how the threshold voltages change with different values of R_F and R_{in}.

If the system already has an input square pulse, but of short duration, a wider pulse can be generated by using the input pulse to trigger a one-shot such as shown in Fig. 8. The chart gives values for C and R so that you can estimate the pulsewidth time in nanoseconds.

A square-wave generator with a fast risetime can be fashioned by connecting the HEP-C3001P as shown in Fig. 9. This is a ring oscillator with the external capacitor and load resistors controlling the frequency of oscillation. Frequency of operation for various values of R_L and C are given in the accompanying chart.

How To Linearize TTL Gates

The HEP-C3000P TTL gate can easily be turned into a linear amplifier; all you do is add some feedback. This is achieved by adding a 560Ω resistor between output and input, and a small resistor of about 220Ω in series with the input. This is shown in Fig. 10. The 560Ω feedback resistor biases the gates so that approximately 1V is provided at the output, which is in the linear region. A slightly smaller resistor will raise the output voltage level and a larger

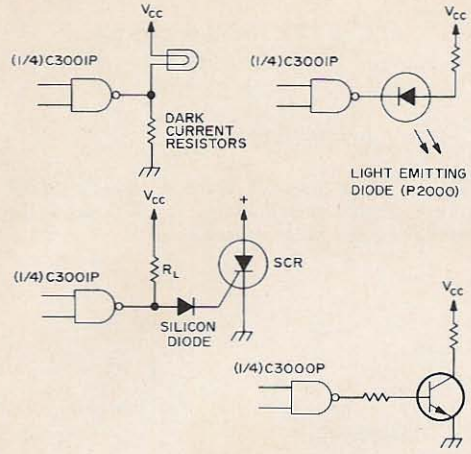


Fig. 4. Representative circuits of TTL gates driving readout lamps, SCRs and other discrete devices. The gate inputs would be connected to flip-flop or some other type of device to provide proper input levels.

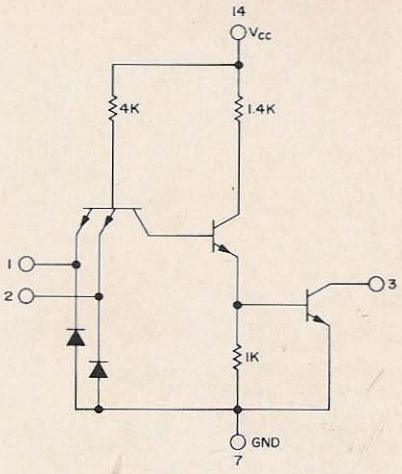


Fig. 5. Typical TTL gate with open output collector (HEP-C 3001P).

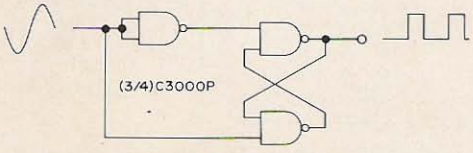
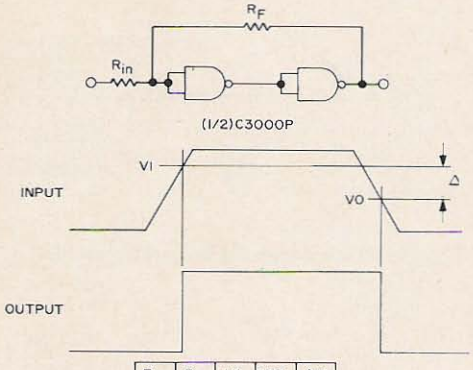


Fig. 6. Pulse shaper.



R_{in} (Ω)	R_F (Ω)	VI (V)	VO (V)	ΔV (V)
300	4.0K	1.07	0.84	0.23
300	6.0K	1.04	0.89	0.15
500	7.5K	0.94	0.73	0.21
500	10K	0.94	0.77	0.17
500	15K	0.93	0.83	0.10
1.0K	7.5K	0.77	0.32	0.45
1.0K	10K	0.74	0.41	0.33
1.0K	15K	0.71	0.48	0.23

Fig. 7. Schmitt trigger.

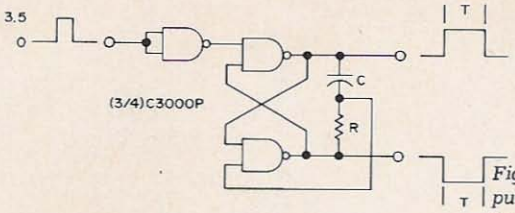
resistor (680Ω) will reduce output voltage to about 0.8V. With this simple arrangement, the TTL gate can be used as an amplifier for audio, video, and rf. As a broadband video amplifier this circuit provides fairly flat response over a bandwidth well into the megahertz region (around 9 MHz). With tuned circuits, it will provide useful gain to 30 MHz and beyond.

Two linearized gates connected in series provides a 360-degree phase shift which makes a perfect oscillator arrangement. As shown in Fig. 11, a crystal can be connected in a second feedback loop around both gates to provide an oscillator operating at the crystal fundamental frequency. This oscillator is good for use with crystals in the 1–20 MHz range.

A low cost square-wave generator that can operate from low audio frequencies up to rf in the 12 MHz range can be fashioned as shown in Fig. 12. The frequency of operation is controlled by C1 and R1. For fixed values of C1, the potentiometer can adjust frequency over a decade range.

Frequency Counters

The most widely used digital circuit is the flip-flop used as a counter. So, to provide a ready reference for all count functions from 2 through 10, we have developed the circuits in Figs. 13–21. Since the big reason for using TTL circuits is their improved speed over RTL, these are all synchronous counters. Synchronous counters require a number of interconnecting gates, but they are much faster than the ripple counter, which usually does not need the gates. The HEP-C3073P is a



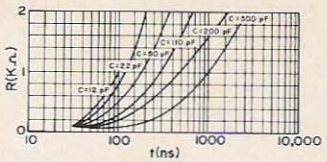
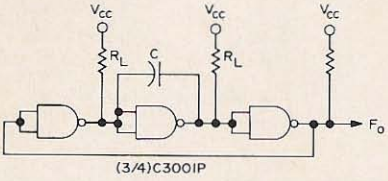


Fig. 8. TTL one-shot used to develop wider pulses. Chart shows values for C and R for various output pulse widths.



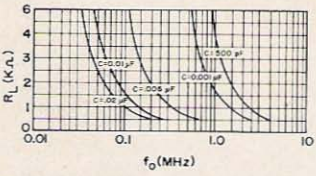


Fig. 9. Square wave generator (Ring oscillator). Frequency is determined by R_L and C as shown in the chart.

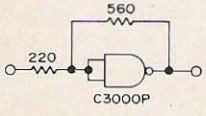


Fig. 10. How to linearize TTL gates with a feedback bias resistor.

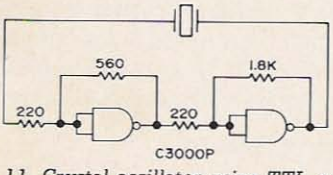


Fig. 11. Crystal oscillator using TTL gates.

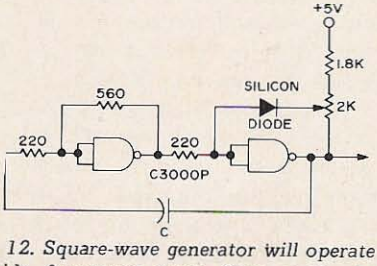


Fig. 12. Square-wave generator will operate over a wide frequency range from audio to RF. Capacitor and pot controls frequency.

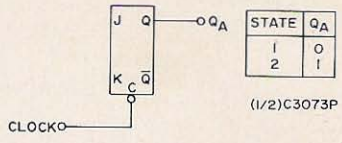


Fig. 13. Synchronous divide-by-2 up-counter.

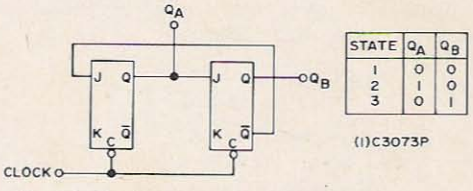


Fig. 14. Synchronous divide-by-3 up-counter.

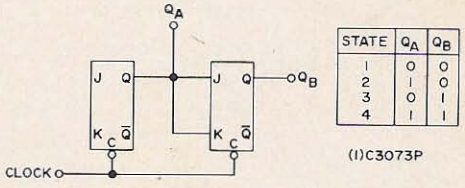


Fig. 15. Synchronous divide-by-4 up-counter.

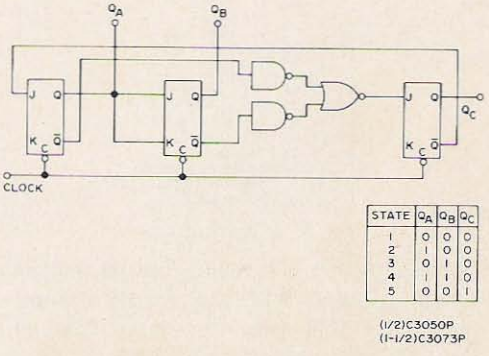


Fig. 16. Synchronous divide-by-5 up-counter.

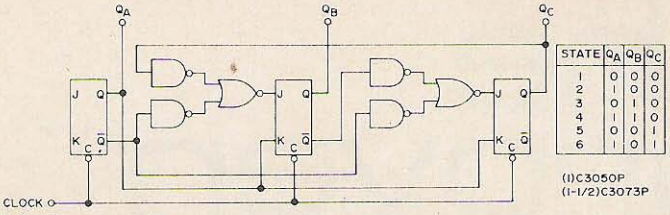


Fig. 17. Synchronous divide-by-6 up-counter.

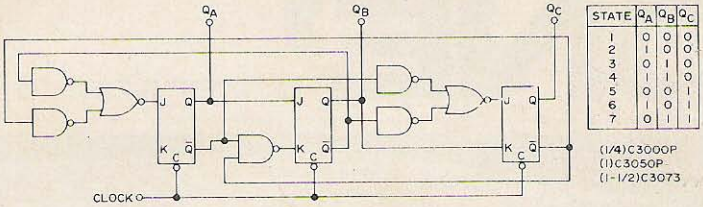


Fig. 18. Synchronous divide-by-7 up-counter.

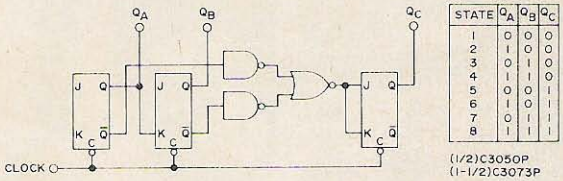


Fig. 19. Synchronous divide-by-8 up-counter.

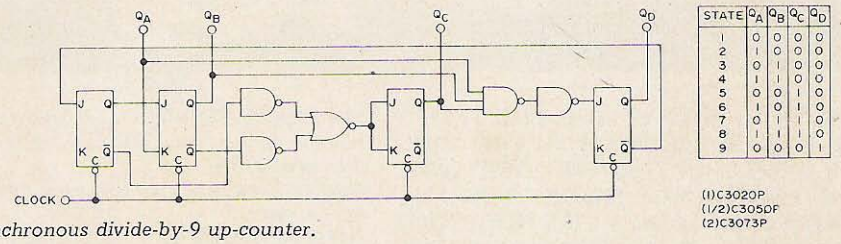


Fig. 20. Synchronous divide-by-9 up-counter.

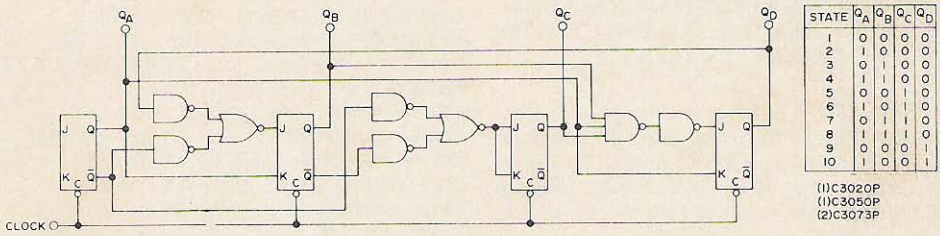


Fig. 21. Synchronous divide-by-10 up-counter.

dual JK flip-flop that triggers at frequencies up to 20 MHz. The HEP-C3050P is a dual 2-input *and-or*-invert gate.

All of the counters operate as follows: The counter starts in state 1 where all flip-flops are at zero. With each negative transition of the clock pulse, the counter steps to the next state in its table. From the last state in the table, the counter cycles back to state 1. The frequency of the pulses out of the last stage of the counter is equal to the input frequency divided by n, the number of states in the table.

. . .Thorpe■

Reference: TTL Design Ideas – Motorola Semiconductor Products Division.

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SOLID STATE VFO: Very stable Colpitts circuit with transistor buffer provides linear tuning over the range 5-5.5 mhz. A passband filter at output is tuned to pass the 5-5.5 mhz. range.

RECEIVER OFFSET TUNING (CLARIFIER): Provides ± 5khz variation of receiver tuning when switched ON.

DIAL CALIBRATION: Vernier scale marked with one kilohertz divisions. Main tuning dial calibrated 0-500 with 50 khz. points. Each revolution of tuning knob covers approximately 15 khz.

FREQUENCY STABILITY: Less than 100 cycles after warm-up, and less than 100 cycles for plus or minus 10% line voltage change.

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INPUT POWER: 300 watts PEP, 240 watts CW

ANTENNA IMPEDANCE: 50-75 ohms

CARRIER SUPPRESSION: -40 dB or better

SIDEBAND SUPPRESSION: -50 dB at 1000 CPS

THIRD ORDER INTERMODULATION PRODUCTS: -30 dB (PEP)

AF BANDWIDTH: 300-2700 cps

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AGC: Fast attack slow decay for SSB and CW.

SELECTIVITY: 2.3 khz (-6dB), 4 khz (-60dB)

IMAGE REJECTION: More than 50 dB.

AUDIO OUTPUT: 1 watt at 10% distortion.

AUDIO OUTPUT IMPEDANCE: 8 ohms and 600 ohms

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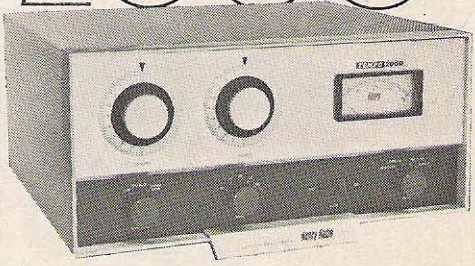

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More Power from 6146s

E. John Labaj W2YW
12 Park Place
Elsmere NY 12054

After some checking and minor circuit changes I found that I could run a pair of 6146s (A or B) at an input of 400 mA at a 1000V, and no sweat.

Observation and measuring indicated that some of the problem with the tubes was like one famous TV personality's drinking problem: He knew his limit but he always lost control before he reached it.

Same with the 6146s. Long before the input limit was reached the tube lost control, resulting in plate-current runaway and tube failure.

While the 6146 plate is about the same size as comparable sweep tubes, the 6146 seems more touchy, tending to gas and go into a catastrophic "spin" with very little provocation.

With the average circuit and biasing arrangement the 6146 tube will have about 20 to 30 kΩ resistance, plus the resistance of the bias supply between the grid and ground.

Now, with a minor tuning fluff, or even normal use, especially on the higher frequencies, and with a few loose electrons around, the 1 control grid will act as a cold cathode and set up a reverse grid current flow. This reduces the actual grid voltage from that coming out of the supply, which in turn causes more plate current, and thus more reverse grid current. In less time than it takes to tell about it, this cumulative action has cost you another pair of 6146s.

This is understandable when you see that the potential on the control grid is greater than that between the actual cathode and screen and plate.

To minimize the bucking effect of the reverse current I jumpered all resistors in the grid circuit with small low-resistance rf chokes. This reduced the voltage drop through the grid circuit string under current flow conditions, either forward or reverse.

To make sure of a stable bias supply I bought some surplus zener diodes and clamped the bias supply at -82V. This fed the hot end of the bias potentiometer, and then, as close to the actual grid as possible but on the cold (rf) side of the grid feed I used another zener diode which was -68V; this happened to be the value that was needed to set the plate current to normal idling (Fig. 1).

To make sure of getting sufficient peak plate current flow, I jumpered the screen feed resistor so that screen voltage was clamped at 260V. The series feed resistor was 1.2 kΩ; the B+ supply under load was 310V – this voltage was clamped by using two 10W zeners in series, as shown in Fig. 2.

To discourage the screens from getting into the secondary emission act, I wired in series with each screen lead a 1 kV, 1A silicon diode rectifier.

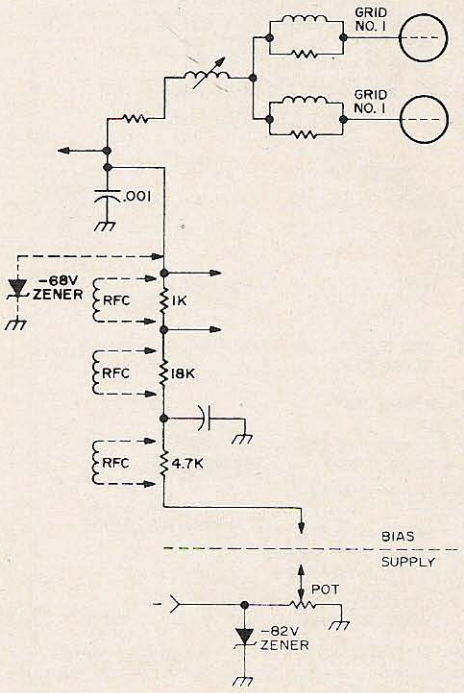

Fig. 1. The addition of zener diodes established a runaway limit. A -82V zener limits the bias output and a -68V zener clamps the grid potential.

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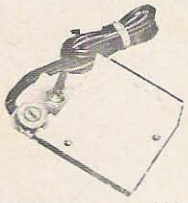

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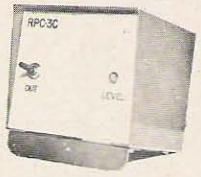

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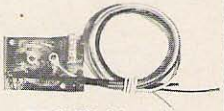

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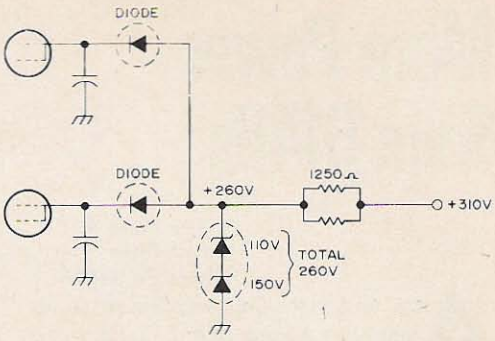


Fig. 2. Zeners can be used in series to help limit the B+. Make sure the diodes are rated to handle the dissipated power if you don't use resistors with them.

In case you need more drive, remember what Joe Namath says: You have to excite them to make them put out! You can juggle the bias and screen voltage on the driver tube – in my case, found that the 6CL6 had over 6V bias on the cathode – and for linear class A operation it should be less than 3V. I shunted the cathode bias resistor and also the screen feed resistor and again using a zener, I clamped the screen voltage at 150V. This gave me enough drive to get about 8 mA (maximum) grid current.

Before you start pouring on the coal, make sure the tubes are neutralized – and it helps if they are matched. Use a fairly sensitive rf indicator across a small 47Ω carbon resistor across the output.

Go over the neutralizing adjustment till you reach the best setting. That is, adjust for good grid current flow – then adjust the neutralizing capacitor for a dip – tune the plate for a peak – again adjust neutralizing capacitor for a dip – retune plate for a peak. By carefully observing the rf indicator you will find a neutralizing adjustment that results in the lowest peak when tuning the plate. That's the spot!

Do not load the 6146 too heavily without drive. In the CW mode at 400 mA it will take about 4 mA. In the SSB mode when kicking to 400 mA, the grid should wiggle 0.5–1 mA.

. . .W2YW■

Radio Direction/Range Finder

Gus Gercke K6BIJ
Box 143
Weimar CA 95736

Working ten years ago with loop antennas, I noticed that the so called "null" was rarely a null; in most cases it was just a sharp decrease in a signal strength. It was further noticed that by tilting the loop a real null became possible. The top of a hand-held loop had to be tilted toward you and away from the transmitting station.

This resulted in an interesting solution to the ambiguity problem; if you got the total null—you are facing the signal, if not—it is behind you.

This angle of tilt, necessary to produce a total zero signal, was and still is a mystery.

A direction finder consisting of aluminum aircraft loop, mounted on a small aluminum hand-held box, containing transistorized receiver (BC band, 80 and 40 meters) and batteries, was constructed. A pendulum was attached to the top of the loop to measure the angle of tilt.

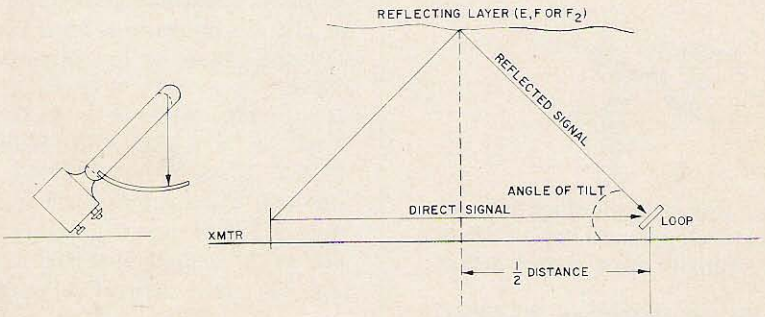
Tests, including a 100 mile diameter drive around a known station, showed a definite dependence of the angle of tilt on the distance to the signal source. The measurements were however complicated by variations in the angle of tilt (time of day, frequency, and possibly some other unknown factors). As far as I could determine (and I did not get very far) this is what probably happens:

A vertically held loop cannot produce a total null because *two* signals are present—direct and reflected from one of the heavyside layers. Somehow these two signals can totally cancel themselves only when the loop is tilted, and in one direction only. It appears that the angle of tilt then is a function of two things—height of the reflecting layer and the *distance* to the station. If so, that distance can be found by a solution of a simple trigonometric problem involving a rectangular triangle with one side (height of the layer*) and one angle (angle of tilt) known.

Unfortunately it is not that simple. Which layer? What is its exact height at the moment? Is there a possibility of a third path?

I was able to calculate the distance with an average 40% error. The frequencies were BC, 4 and 7 mhz; all distances less than 100 miles.

All this was done ten years ago; I tried to get people interested in this project, but only one person showed up to look at it. When I explained that a lot of developing is yet to be done, his face produced an



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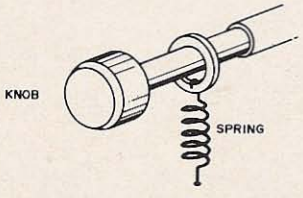


A thin wire or washer on the shaft held under slight spring tension, inside the set where it won't show, will give good vernier action again.

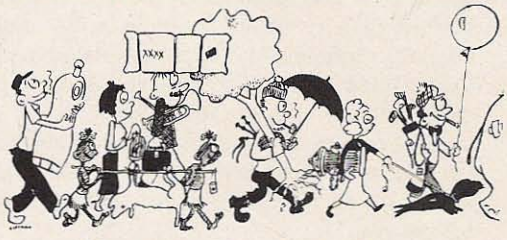
Richard Mollentine, WAØKKC

expression of a man in whose mouth suddenly materialized a dead rat beamed down from the "Enterprise."

Anyone want to take over where I left off ten years ago, do some experimenting, and become immortal? I am busy with my radio controlled submarine models, and gave up on this one.

. . . K6BIJ

***If my assumption that the "angle of tilt" is a function of the height of the reflecting layer is correct, then this height can be measured by solving the same trigonometric problem. In this case we measure the angle of tilt necessary to produce the "null" in a signal coming from a station located a *known* distance away.**



Moving? Please let us know.

OOPS!

K6MVH's "Gain Antenna for VHF/UHF Repeaters"(73, July, 1971, page 42) is not really so non-critical that all dimensions can be left to the reader's imagination. Neither can it be said that we purposely deleted the dimensions to test how alert our readers really are. Actually, somebody goofed and forgot to put the dimensions onto Figure 1. The dimensions for this antenna are: **2 meters**: A = 19", B = 13.3", C = 26.6". **450 MHz**: A = 6.33", B = 4.44", C = 8.875". **220 MHz**: A = 12.66", B = 8.88", C = 17.75". Note also that the bottommost coaxial section in Figure 1 is incorrectly identified as "C" length. It should of course read "B", as is clarified in the caption.

Ken W. Sessions K6MVH

Curtis CW Identifier

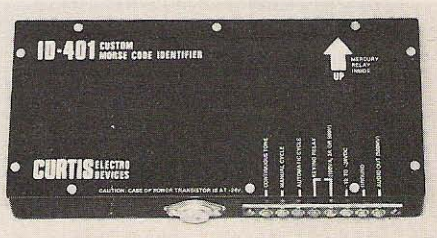
When repeaters started getting very popular and manufacturers began to tool up their assembly lines for production of 2m FM transceivers, a representative of Curtis Electro Devices called me to ask what the potential might be for a repeater ID unit. Curtis has been manufacturing electronic keyers for some time, and the switchover to an automatic ID unit seemed logical enough. It seemed to me that the market could certainly afford at least one manufacturer in the identifier field, provided that the manufacturer could afford to produce the unit at a cost that was within the budget of the average repeater group.

The Curtis people were not too involved with repeater operation, but they wanted to make their identifier solve all the problems associated with automatically identifying repeaters; so the representative listened while I listed all the desirable features such a unit would have – which were considerable. Within two months, I opened a package that came in the mail and found what I consider to be the ideal identifier. Curtis had taken the ideas I'd given and combined them with some of their own, and the result was a working production ID unit that can be easily installed into any repeater within minutes. What's more, the Curtis identifier contains in its one small package all the control circuitry, tone oscillator, and relay contacts required to make the unit immediately operational.

When properly connected into a repeater, the identifier will send out a modulated CW signal when the first carrier appears on the repeater input. From that point on, it will identify at three-minute intervals as long as the repeater is being used. When all the carriers drop out and the repeater is no longer being accessed, the Curtis identifier will send out one more ID at the end of 3 minutes, then it will keep quiet; and it will remain quiet until someone else comes along and uses the repeater.

The unit has a built-in speaker so that you can hear the ident when you are testing or installing the system. And an inside-mounted switch allows you to cut off the speaker when you're through making checks. The unit has a set of relay contacts built in, too. These contacts stay closed during the time the identifier is generating its signal; they are used to lock the repeater transmitter on during an ident so the identification signal won't get cut off in mid-sentence.

Other features include a volume control to adjust the level of the modulated CW signal into the repeater transmitter, a speed control to adjust the rate of the automatic identification signal, and various terminals to change the mode of operation from "automatic" to "manual" – or from periodic keying to keying each time a carrier appears.



The Curtis ID package. The terminal strip gives access to all control, voltage and ground points needed for fully automatic operation.

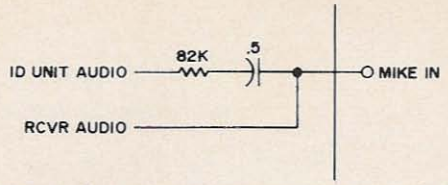


Fig. 1. A series resistor/capacitor network in effect increases the impedance of the ID unit's audio output, and prevents circuit loading.

The Curtis automatic identification unit should be compatible with most repeaters, because it uses a negative dc voltage (12–28V) for control. A ground signal, as from the carrier-operated relay, keys the identifier, but does not cause triggering of the ID until the required time period has elapsed.

When I connected the identifier into the WA1KGO repeater, I noticed that the audio from the Curtis unit tended to swamp the audio arriving from the receiver. This situation resulted in repeater users being jammed out by the identifier. I placed an 82 kΩ resistor and a 0.5 μF capacitor in series with the audio lead from the identification unit (Fig. 1), and that solved the problem.

I didn't do a great deal of thinking or planning before I connected the ID unit initially, and I ended up paralleling the ID unit's contacts with those of the transmitter PTT. This is an acceptable scheme, but it resulted in an automatic identification every three minutes, day and night, even when the repeater was not in use. This was because of the small bias voltage on the PTT line. If you like to sleep with your monitor receiver on, you'd be driven quite mad with this sort of hookup. I know I was. So I raced up to the hilltop and made a few small control-circuit changes; the final interconnect circuit is shown in Fig. 2. This latter arrangement keeps the unit from generating an ID signal unless the repeater is actually being keyed, but it does not keep the unit from finishing its ID once it's started, even if the incoming carrier drops out.

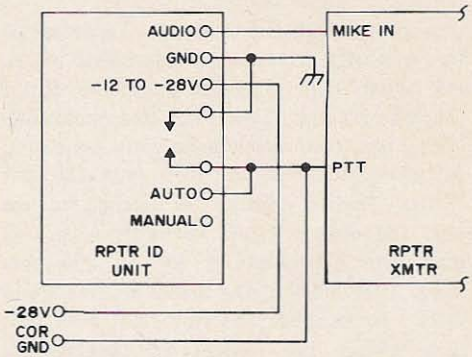
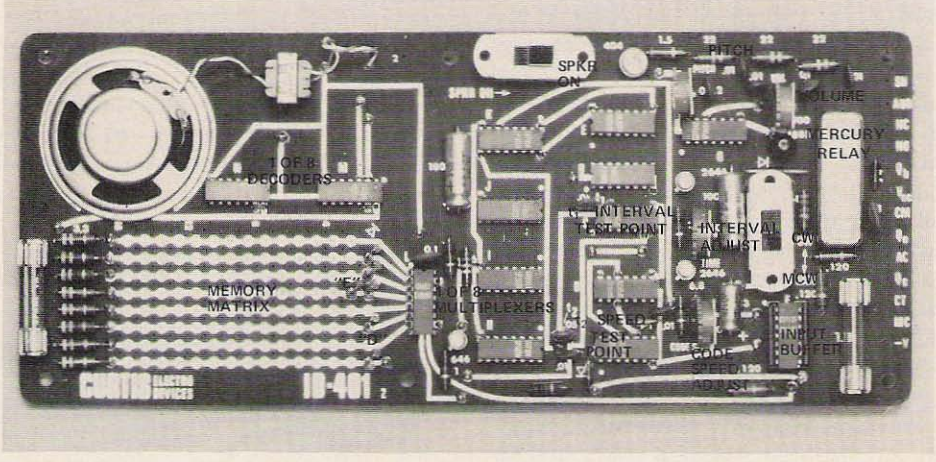


Fig. 2. This interconnect scheme allows identification only when repeater is in use.

Technical Aspects

The block diagram (Fig. 3) can be used to follow this operational description. When a signal from the carrier-operated



Inside the Curtis ID-401. A PC-mounted speaker (upper left) allows monitoring of the audio signal even before the ID unit is connected to the repeater. The memory matrix (below speaker) can be programmed or reprogrammed by amateurs in the field. The matrix shown is programmed for "DE" only, as indicated by the diode placement.

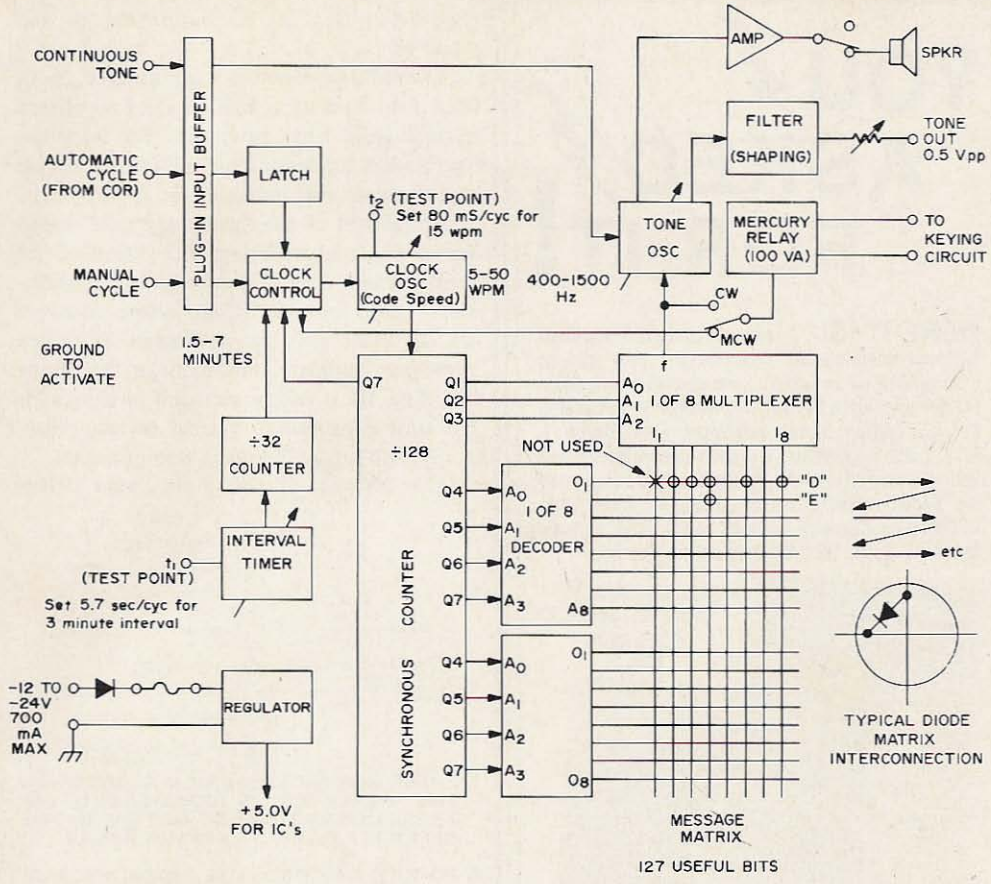


Fig. 3. Block diagram of Curtis ID-401 identification unit.

relay in the repeater grounds the "automatic cycle" input a latch is set indicating the closure regardless of duration. For the first closure after the repeater has been at rest, the clock control starts the clock which is fed into a +128 counter. This counter is fed to two 1 of 8 decoders and one 1 of 8 multiplexer. The decoders ground the horizontal matrix lines in sequence starting at the top and proceeding downward. Each line is held low for eight clock cycles.

At the same time, the 1 of 8 multiplexer is scanning the vertical lines – acting in effect like a single-pole, eight-position switch. In this manner the matrix is scanned bit by bit from the upper left down to the lower right.

Each intersection between the vertical and horizontal lines which is connected by a diode pulls the input of the multiplexer low. Each "low" is interpreted as a dot; three in a row is a dash. Where a diode is not connected, the output represents a space. In effect, the memory plays out just like a paper tape. You can read the message by examining the diodes. Programming or reprogramming requires only a knowledge of Morse code and no knowledge of Karnaugh maps.

The memory plays out one time and stops until the interval counter counts out the set interval at which time the program will play out once more. If the repeater has been activated during the waiting period the timer will again count out a set interval and cause the unit to identify once more. Only when an interval passes without repeater activation will the unit cease identifying. And at the same time, the unit will not ID *more often* than the set interval

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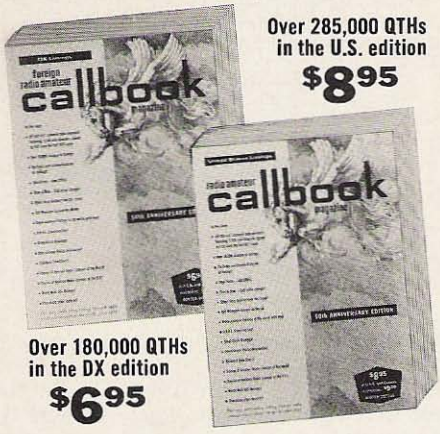

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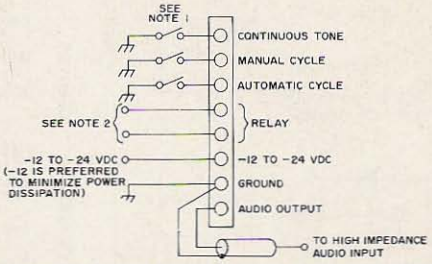
regardless of what is happening at the repeater.

The interval timer is a unijunction oscillator followed by a +32 counter to obtain reliable long time intervals over temperature and independent of line frequency (in case the unit uses batteries for standby).

Activation of the "manual cycle" input causes continuous IDing. Activation of the "continuous tone" input gives a continuous audio output. These three controls are all buffered by a plug-in IC since improper hookup may damage the input ICs. The IC is easily changed in the field. The unit is protected against reverse polarity. A fuse (and a spare) is also provided.

The output of the multiplexer drives



1. THESE CONTACTS SHOULD CLOSE WHEN THE REPEATER IS COMMANDED ON. THESE CONTACTS MUST NOT BE ON THE REPEATER CARRIER KEYING RELAY.
2. TO KEY CARRIER, USE DIODE ARC SUPPRESSION WHEN DRIVING RELAYS. ALSO R/C SUPPRESSION. SEE CHART.

Fig. 4. Terminal strip of the 401. Internal controls are set as follows at factory: Speed, 15 WPM; Time, 3 minutes; Pitch, 650 Hz; Volume, Full; Speaker, On. Relay Mode, MCW.

both the MCW oscillator and a mercury reed output relay. The relay may be switched to either a CW (keys the Morse) or MCW (key down during whole program) position.

The audio drives both a switchable internal speaker and is filtered and level controlled for directly modulating the repeater carrier.

The interval timer is variable between 1.7 and 7 minutes, the speed from 5 to 50 wpm and pitch from 400 to 1500 Hz.

The regulated power supply allows operation from −12 to −28V dc and draws about 700 mA.

The unit employs 14 ICs, three of which are MSI types. . . . K6MVH

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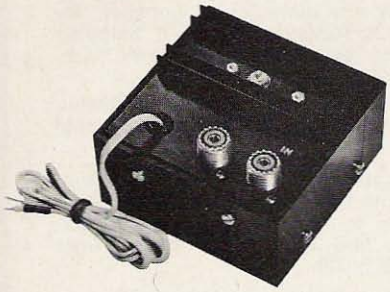

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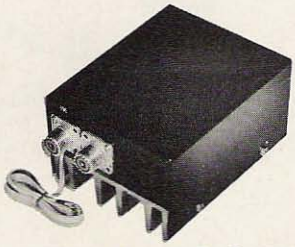

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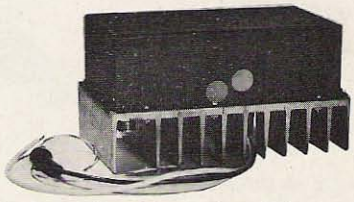

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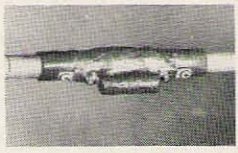

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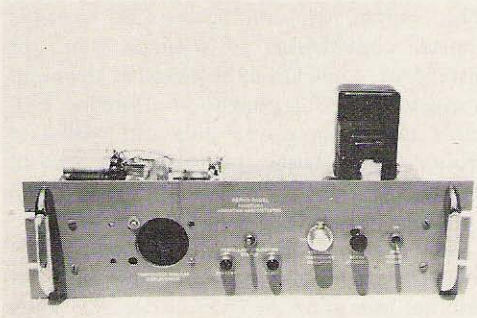
MORSE MEMORY

All of the Morse code message sending devices which have been in the amateur radio magazines have been designed to send one short message over and over again, usually for repeater identification. They all have been useful for one limited application and have lacked the versatility that is possible using some of the newer advances in integrated circuit technology. The Morse Memory is capable of sending a message in code at any speed as many times as desired. The distinctive difference is that the message in the memory can be changed in a matter of seconds by a simple programming process.

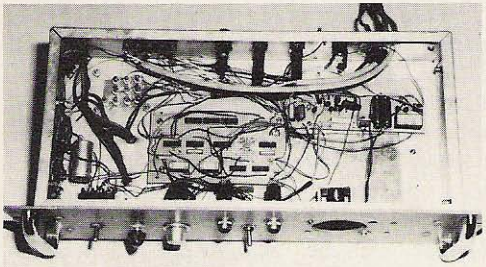


The controls from left to right are memory select, speed control, audio volume, power. The speaker is at the far left, and two power supplies are mounted on the top.

With the encoding scheme used here, a message up to 30 letters long can be stored in the Morse Memory, depending on the length of the letters in the message. This is more than enough to handle any message needed in a contest-type operation and it is also sufficient to send messages during normal daily operation. For example, the Morse Memory can be used during a contest to send repetitive messages such as CQ FD CQ FD DE WA6ATT/6 K. With the simple addition of another integrated circuit memory, two different messages can be sent. For instance, the alternate memory can be used to store the message DE WA6ATT/6 599 LA LA K, sent directly after you send the call of the station which you had just contacted. To send either of these messages you must only push one button and the Morse Memory will do all the rest. On the last Field Day our group used the Morse Memory for every CW contact and it now seems difficult to imagine how we operated CW in contests before. It took care of about 90% of all situations which we encountered. Since the Morse Memory does not hold any message permanently, for the next contest two different messages can be programmed into the unit.

The Morse Memory uses an integrated circuit random access memory (RAM) instead of the large diode matrices used in many of the other projects. Each IC memory

can hold the same amount of information as a diode matrix containing hundreds of diodes. These memories were first produced less than 5 years ago and are now being used in the newest computer systems. The price for individual units has just dropped to the point where they are economical enough for amateur use. The particular memory element used in this project is the Intel type 1101 MOS large-scale integration device. It is capable of storing 256 bits of binary information in a 16-pin dual inline integrated circuit package. Unlike the rest of the logic in the Morse Memory which uses regular P and N type silicon construction as in regular transistors, the memory chip is constructed from silicon and silicon oxide such as is used in MOS FET's. To give some idea of the degree of miniaturization involved, there are over a thousand of these FET's in each memory chip.



The main IC board is in the center with the transmitter interface in the upper right. The third power supply is mounted on the left wall.

Inside the 1101 there is a memory plane of 256 bistable latches arranged in a 16 x 16 matrix. Each latch must be in one of two possible states at any one time. These two states are normally abbreviated 1 and 0 to represent a high voltage or a low voltage. It is possible to *read* that is, to find out which state a particular location is in, and it is also possible to *write* which involves changing the information in the latch to that of the input signal. Since there are 256 bits of memory, any number from 0 to 255 will correspond to a different memory location. This number is put on the address leads to single out the memory location wanted. All of the necessary decoding is done inside the memory chip itself. For instance, if you wish to read the contents of location 157, you would simply put that number on the address leads and observe the DATA OUT lead. Since the device can understand only binary information, that number must first be converted into binary. It takes eight binary digits to differentiate between 256 different locations; in this example location 157 corresponds to binary 10011101. Although it seems difficult to decode all of these numbers, it happens that there are relatively simple devices which take care of this problem.

All the rest of the circuitry in the Morse Memory is transistor-transistor logic or TTL. This type of logic is used far more in industry than the RTL devices which have been most common in previously published projects. TTL has many advantages over its RTL counterpart; these include high speed, reduced power dissipation, and lower output impedance. For instance, the entire IC portion of the project which includes over 2500 transistors requires only 1.7W and is capable of sending a message at around 1 million words per minute. The particular type of TTL used was the 7400 series. Each member of the series is designed to be compatible with the other members of the series. In addition, there are at least five companies which make their own versions of the 7400 series, each of which is designed to be compatible with units produced by another company. The larger companies producing a 7400 series are Texas Instruments, Sprague, ITT Semiconductor, Motorola, and Philco. Because of its completeness and availability, I used the TI series. The basic internal differences between TTL and RTL are that TTL inputs of *nand* gates are multiple emitter connections to a single transistor instead of connections to bases of different transistors in RTL, and the outputs of TTL gates are pulled up to plus and pulled to ground by different transistors instead of just having the output pulled to ground and a resistor to plus in RTL

In order to understand the operation of the unit it is not necessary to understand the internal operation of each device. The only thing which must be considered is the truth table, or mathematical description of each chip. *Nand* logic is used in the system, and the only fact which must be remembered

about these devices is that a 0 signal on any input forces a 1 output. Whenever all inputs are 1's, the output is then zero. In addition, whenever any input pin on the TTL devices has no connection to it, that pin is considered to be in the 1 state.

The most common arrangement of *nand* gates in this project is called the bistable latch; there are over five hundred of these latches in the entire project. Three are outside the memory chips and must be wired, so they should be understood. They could be considered the digital equivalent of a child's seesaw. Just as one end of the seesaw must be in the air and the other on the ground, if one output of the latch is high then the other is at ground. To put a particular end of the seesaw in the air you must push on the ground. To put one output of the latch to a high state a negative pulse, that is, a pulse to ground, must be applied to the input of the *nand* gate whose output needs to be changed. If the pulse is applied while the output is already high then nothing will happen. If the seesaw has a weak center pivot, when both sides are pushed up the center will break, and both sides will go high. If both inputs are grounded, both outputs will go high.

Aside from the *nand* gates and inverters in the Morse Memory, there are three other different TTL devices: one-shots, divide-by-16 counters, and shift registers. The action of the one-shot is basically simple. It gives a pulse of a predetermined length at the output whenever there is a negative going edge of a pulse at the input. The one-shot will not fire again until the input signal goes positive and then goes negative. There is inverting action in the device so both a positive and a negative pulse is available at the two output terminals; the terminal with the positive pulse is Q, and the one with the negative pulse is $\overline{Q}$. There are two timing terminals to set the length of the pulse by a resistor and capacitor combination. With the values shown the pulse length is about a millisecond, long enough to detect easily, but short enough so that it will not conflict with the other signals.

Internally the one-shot is fairly simple with only a flip-flop and a pair of gates; the other two devices are a bit more complex than the one-shot but not as complex as the memory. They are therefore known as medium scale integration or MSI devices. Each of the four chips contains four flip-flops internally wired in slightly different ways.

The divide-by-16 counters has each output of the flip-flops connected to the clock input of the next flip-flop. In this way each flip-flop divides by two for a total division of 16. Each of the outputs of the flip-flops is available at a different pin on the package, and with the divide-by-16 output of the first chip connected to the input of the next chip, a clock input to the first chip will be divided by 256 at the output of the second chip. These two chips have a total of eight outputs each at a frequency which is one-half of the preceding signal. If the counters are first reset and a clock signal applied, the devices will count from binary 00000000 to binary 11111111, that is, from 0 to 255. These signals are exactly what is needed to address the memory.

The four bit shift registers each have four flip-flops connected in a slightly different arrangement. The Q and $\overline{Q}$ output of the preceding flip-flop are connected to the J and K inputs of the next flip-flop. With the clock leads all connected together the end result is that the information contained in the preceding flip-flop is transferred to the next flip-flop whenever the clock line is pulsed. With two of these devices connected together, information which is put on the input will be at the output of the last flip-flop exactly eight clock pulses later. This is the digital equivalent of a delay line. As in the counters, each flip-flop has its output available to use. If the input of the shift register is connected to the message output of the memory, and the address to the memory is changed at the same speed as the shift register is clocked, then the last eight bits of message are always contained in the register.

The Morse Memory simply contains the devices mentioned hooked up to perform the required functions. There are many ways to encode the message in the memory, and the peripheral circuitry of the memory will be entirely different with different coding schemes. Here perhaps the simplest method of coding was used. It is a simple time-based

code where a dah is represented by three ones, a dit by a single one, a space between dits and dahs by a zero, and a space between characters by three zeros. The space between words is a matter of personal choice; either 5 or 6 zeros will suffice. If the message is coded in the memory in ones and zeros serially from location 0 to as high as needed by the length of the message, when the address is started at zero and counted up toward 255, the message will be sent in perfect code. To signal the end of the message, eight zeros are added to the end of the message. For example, the message "DEI" would be coded: 000111010100010001010000000. As the eighth zero has just been sent, the *nand* gate which samples all the outputs of the register will have all ones on its 8 input pins and the output of the gate will go to ground, pulsing the reset one-shot.

The basic sending cycle is therefore as follows. Assuming there is a message in the memory, and the address counter is reset, the start button is pushed. This puts a zero on one of the inputs of the start latch causing that gate to have an output of one. That one opens the clock signal gate allowing the clock signal to go through to the next date. The $\overline{Q}$ output of the one shot is normally high allowing the clock signal to go on to the counter and shift register. The counter begins to count from 0 to 255, sending the message in the process. The shift register keeps track of the last eight bits of message sent, and when the eight zeros signifying the end of the message appear, the *nand* gate fires the one-shot which both resets the counter to zero and closes the clock latch. The message is now ready to be sent again.

There are only four other parts of the complete unit; they are the programming circuit, the clock circuit, the transmitter interface, and the power supplies.

Of the four, the programming circuit is the most unusual. The particular memory device used, the 1101, has both a read/write input and a DATA input. The read/write, or R/W, input is normally low for the read cycle. When the R/W input is made positive, whatever signal is present at the DATA input is put into the memory location which is addressed at that time regardless of what was in that location before. During the write cycle two "bounceless" switches are used to

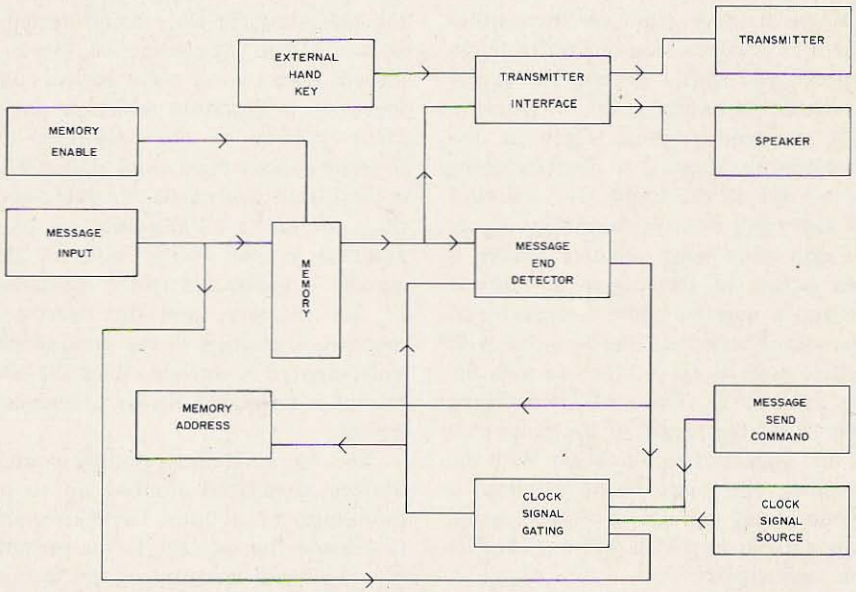


Fig. 1. The block diagram for the entire unit except power supplies. The signal paths are shown by the arrows.

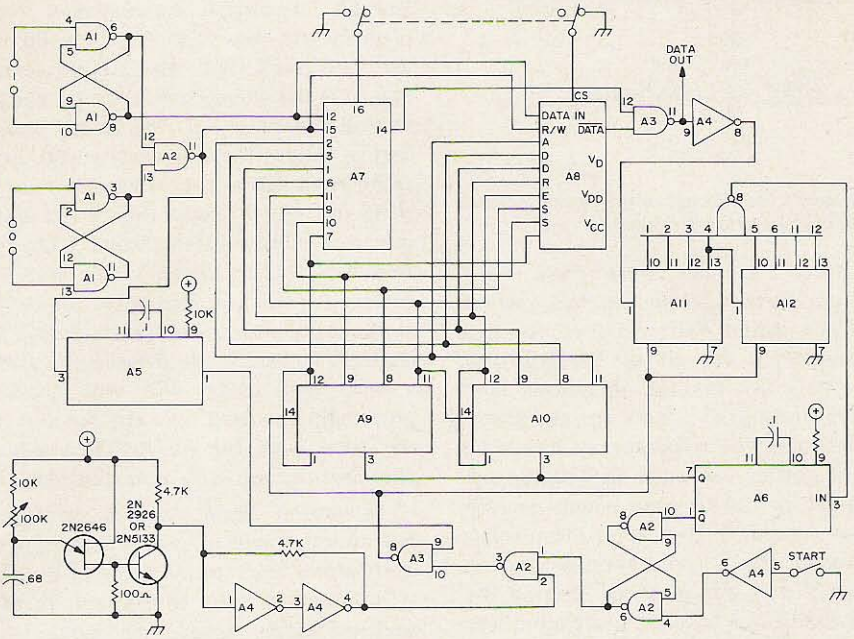


Fig. 2. The circuit diagram for the IC and clock portion of the unit. The numbers in parentheses refer to the 7400 series part numbers, and A, B, C, are three different type 7400 quad 2 input nand *gates.*

input the ones and zeros of the message. As each of these switches are pressed the R/W line goes positive, and the appropriate signal, either a 1 or a 0, is sent to the DATA input of the memory. As either of the input buttons is released, another one-shot pulses the clock line which advances the memory address one position so that it is ready to receive the next bit of message.

The clock circuit uses a unijunction transistor to provide a variable speed clock signal. With the resistor and capacitor combination shown, the Morse Memory will send Morse code at any speed from about 5 to 100 words per minute. A smaller capacitor could be used to increase the speed any more than this. The clock signal is further processed after the unijunction. Although the unijunction delivers a pulse with a very short fall time, the rise time was a bit too long to properly clock all of the devices. The transistor and two inverters are used to decrease these rise and fall times of the clock signal. The clock runs continuously and the output signal from the clock circuit is gated by the logic mentioned earlier. Since the speed of the clock signal can be varied over about a 20 to 1 range, a ten-turn potentiometer and counting dial was used to give better control of the speed.

The transmitter interface circuitry contains the devices necessary to both key the transmitter and to provide a sidetone output for the operator. There is a phone jack to allow a hand key or an electronic keyer to operate in parallel with the Morse Memory. The output of the memory and the key are cross-coupled so that either drives both the audio output and the reed relay which is used to key the transmitter. The tone of the sidetone is set by the two capacitors in the multivibrator; to increase the frequency of the tone simply decrease the size of the capacitors. The reed relay which is used is capable of following the output over the full range of speeds with no detectable error, however its power handling capability is rather low, so use it with grid block keyed rigs only. If your transmitter has cathode keying another larger relay could be keyed either from the reed relay or a larger driver transistor.

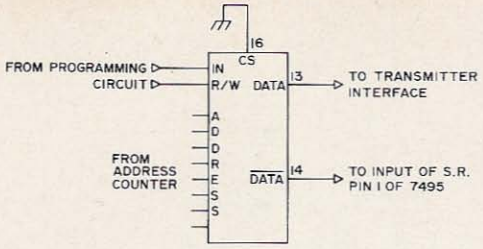


Fig. 3. These are the changes to the circuit diagram if one memory operation is desired.

The power supplies were constructed mostly from parts from the junkbox and are intended as a guide. Three different voltages are needed, +5.0 for all of the IC's and clock, 9.0 volts for the memories, and somewhere around +12 volts for the transmitter interface. The 5 volt supply should be capable of putting out close to 250 mA for an extended period of time which necessitates some type of heat sink on the regulating transistor. The −9 volt supply only has to handle 25 mA per memory chip so the power dissipation is reduced quite a bit. Try to make certain that the regulation is within ±5% and the ripple is less than .05 volts for both IC supplies.

Since it is fairly difficult to make a printed circuit board with the number of crossovers and with the extremely close spacing which is characteristic of large integrated circuit projects, the main parts ot the Morse Memory were constructed on Vectorboard with the .1 inch hole spacing which exactly matches the pin spacing of the 14 and 16 pin dual inline packages. To interconnect the pins #26 tinned solid copper wire was used. This wire is thin enough so that there is plenty of room to work with around the pins, but it is heavy enough so that it doesn't break easily and holds it shapé well.When the wires cross or come close to other pins the wires must be insulated. Plastic tubing which has an inside diameter slightly larger than the wire is perfect for this job, but some plastic tubing melts easily during soldering. Teflon tubing is ideal. To attach the wires to the pins form a small loop in the wire with needle nose pliers, slip the loop over the pin and tighten the loop with the pliers. Then solder the wire and the pin with a small soldering iron.

Integrated circuit sockets are useful but need not be used in excess. When the socket costs about the same as many of the cheaper IC's it seems silly to protect them with sockets. Each person can make his own decision about where to use the sockets; I used them only on the two memory units. Since the connections to the pins are made by wire, the IC's can be removed simply by taking the wires off pin by pin. On a printed circuit board the task would be much more difficult.

The entire project is housed in a surplus rack panel which seemed suited for the task

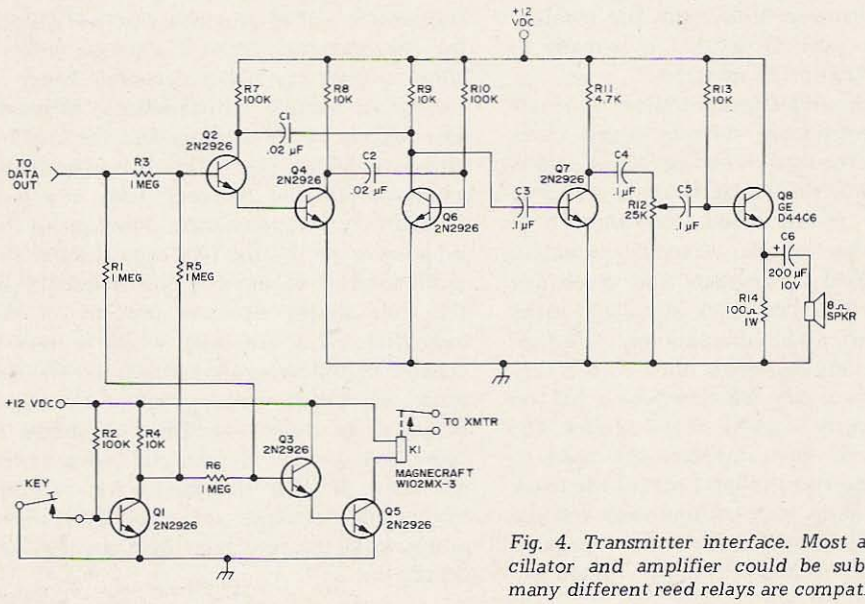


Fig. 4. Transmitter interface. Most any audio oscillator and amplifier could be substituted and many different reed relays are compatible.

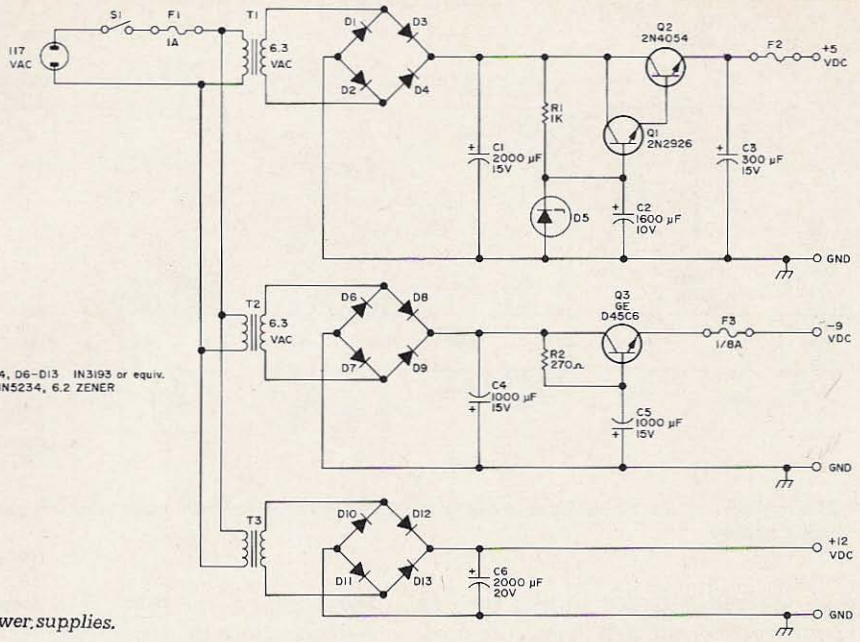


Fig. 5. Power supplies.

and was available on the day before field day. With all of the power supplies and controls the Morse Memory takes up a reasonable volume. With smaller transformers the weight and volume would be reduced by a large degree. I found no reason to label the controls; this job could, however, be done easily with the dry transfer type lettering. Make certain that the completed unit provides a reasonable shield against rf. This will prevent false keying by a nearby transmitter and will prevent false programming.

The operation of the Morse Memory will depend on the number of memory units used. With one 1101 most of the time some type of CQ message would be most useful. This will be somewhat shorter than the 10-minute CQ's heard often around the bands, but it can be repeated at a touch of a button. This message can be changed from CQ FD to CQ DX to TEST. With two memories full contest operation can be implemented. Of course an additional 1101 can be added at any time to increase the versatility of the unit. The wiring differences are minor between the two units. With one memory the chip select (CS) is tied to ground, DATA to the interface units, and $\overline{\text{DATA}}$ to the shift register. With two or more units all the address and input leads are connected in parallel. The CS leads are connected so that only one lead is grounded at a time and the rest are tied to plus. All of the $\overline{\text{DATA}}$ outputs are put to different inputs of a *nand* gate, the output of this gate goes to the transmitter interface, and this signal is inverted and fed to the shift register.

Once the unit is wired the first job is to check the power supply, clock, and interface. Be absolutely certain that the IC supplies don't go more than a few tenths of a volt above the ratings, and be absolutely sure that the polarities are correct to all units. It takes only a few milliseconds for the IC's to be destroyed with wrong polarity supplies. It is a good idea to test the IC board with commercially built power supplies with current limiting which might save a chip. After these dc tests, pressing the start button will normally produce some output signal even without programming a message. This is the state which the memory takes whenever the power is turned off and turned back on. To hold a message the power must be continuously applied to the memories. If there is no message start tracing the clock signal through, make sure that the counter is counting, and see if the shift register is working. Watch for leads which must be

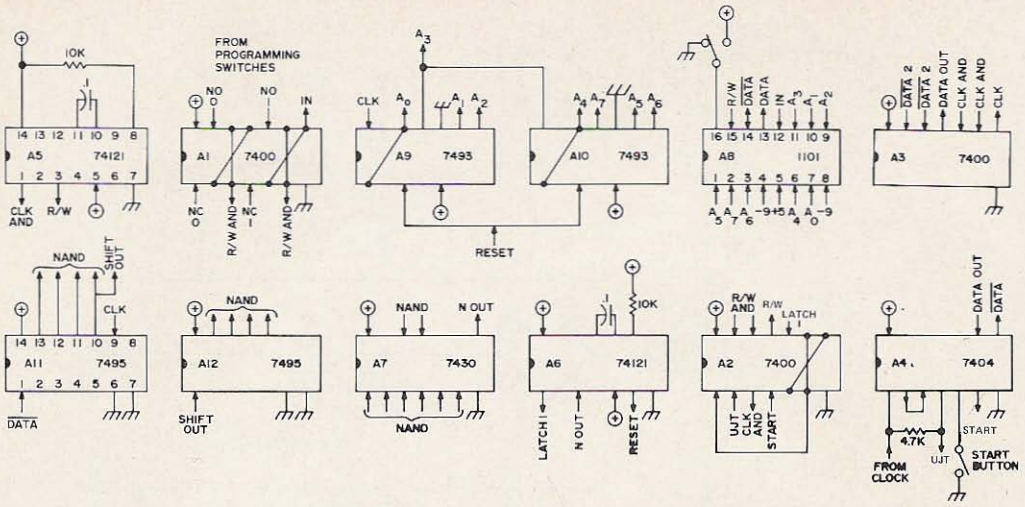


Fig. 6. The top view of the IC packages showing the interconnections of the pins. Wire the pins with the same names together.

normally grounded or tied to plus such as CS, counter reset, and R/W lines. The next job is to program a message and check the entire cycle. To put in a message code the Morse code into ones and zeros, and push the one and zero input buttons in the same sequence. To avoid confusion, turn the audio volume all the way down. Once the eight zeros are put in at the end of the message, turn the volume back up and push the start button. The code should be sent by the Morse Memory at a speed dependent upon the clock speed. With a little practice the programming will take very little time; it should take about two minutes to put in a 30 letter message in the memory. Once a message is put in one memory, if there is another memory chip in the unit switch the CS switch to the other memory and put another message in that chip. This will not affect the message in the first chip.

All of the TTL devices are readily available through any large supply house but prices can vary, so shop carefully. Be certain to specify the plastic dual inline package which is abbreviated as "N" or "P" after the device number. The Intel memory will be the hardest device to find although there should be no real problem. There was a recent price cut for the 1101 in a plastic package. The designation for it is the P1101A and the price is $20 in single unit quantities. This works out to something like two cents per transistor. The memories are available through Hamilton/Avent Electronics and Cramer Electronics. These two companies have offices in many of the larger cities in the U.S., but if there isn't a location in your area contact Hamilton Electro Sales, 10912 W. Washington Blvd., Culver City CA. There is a very complete data sheet for the 1101 which is very helpful in understanding the operation of the memory. This may be obtained from Intel Corp., 365 Middlefield Road, Mountain View CA 94040, or the local distributor in your area.

Aside from being a very versatile project and useful in many different areas, this project contains almost every type of integrated circuit device and will give a very thorough introduction to this rapidly expanding field. I would like to thank Dr. Carver Mead, Caltech, for his help on this project and the very thorough introduction to the field which he gave me.

. . .WA6ATT

Note: Devices and technical data are available from Circuit Specialists Co., Box 3047, Scottsdale AZ 85257. 1101A memory – $20; 7493 – $1.90; 74121 – $1.80; 7495 – $2; 7400 – $.45; 7404 – $.45; 7430 – $.45; 2N2646 – $1.20; 2N5133 – $.30; 2N2926/HEP726 – $1; 2N4054/HEP244 – $1.75. Also available is 4" x 8½" vectorboard with holes on .1" centers and instant printed circuit subelements for mounting and soldering to the integrated circuits. The cost of the board and the instant PC subelements is $5.25. Please add a small amount for shipping.

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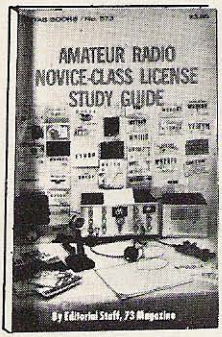

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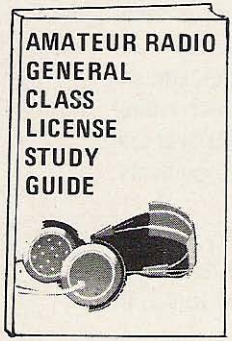

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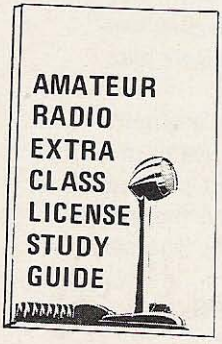

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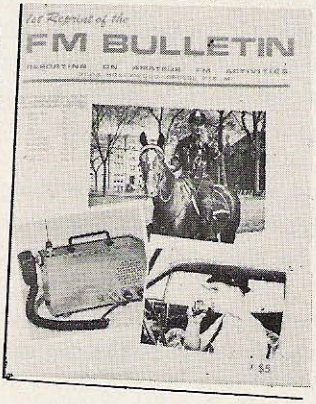

F The FM Anthology has reprints of all of the articles and technical data from the early issues of the FM Journal. No FM library is complete without this data, much of it just not available elsewhere.

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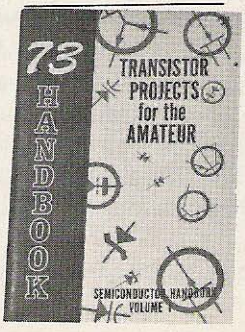

H Transistor Projects for the Amateur is crammed with over 40 interesting construction projects covering receivers, converters, and transmitters, many in the VHF region. If you like to build you will blow your mind over this book.

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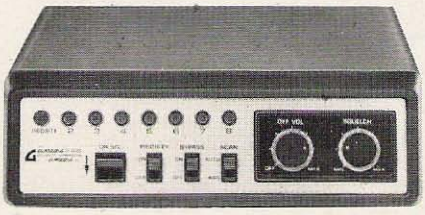

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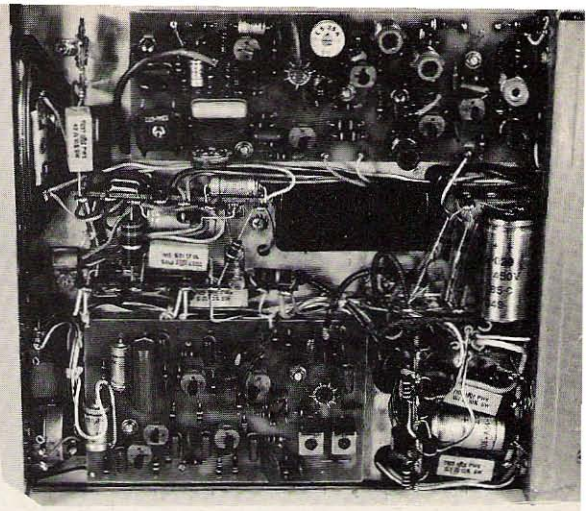

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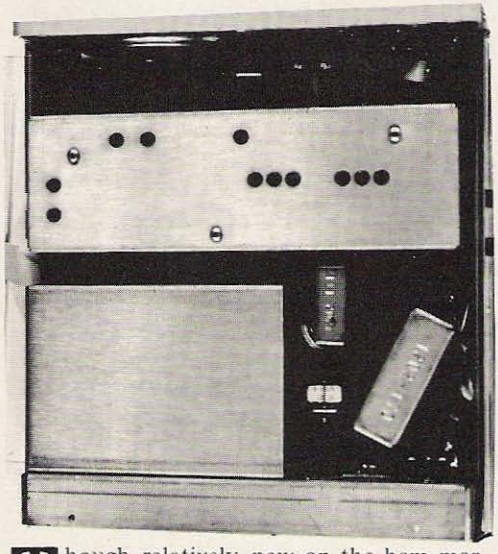

the GLADDING 25 FM TRANSCEIVER

Though relatively new on the ham market, the Pearce-Simpson Gladding 25 transceiver is showing up on the air very rapidly.

The big difference between it and the other units is that "25" in the name, which means 25 watts output. Power has come to two meter FM. Surprisingly this power is available at a price that is remarkably competitive. The Gladding 25 sells for $249.95 in the 12-volt model and for $299.95 with a matching ac power supply.

The two meter model is almost identical with the famous Gladding marine transceivers, which are about the best selling in the world. This volume of business undoubtedly helps them to keep their price a lot lower than it might be if they were making units for amateur radio alone.

Those of you who have read the ads for solid state amplifiers recognize why most FM transmitters are limited to around ten watts. Transistors are available for up to 100 watts or more, but the price is a bit out of the average amateur pocketbook range, running up to over $200! Gladding pulled a fast one with their rig by using tubes in the driver and final. Tubes may be old fashioned in some circuits, but for power amplification they are still the least expensive route.

The Gladding, like the Drake, Tempo, Telecomm, Sonar and Swan units, uses 12 MHz crystals for the transmitter. The receiver uses 78 MHz crystals, which is a departure . . . this being the only amateur FM rig we know that uses these. The transmitter crystals have air padding capacitors for zeroing in the channel. There are six separate channels.

The transmitter has a power level switch

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which helps conserve your car battery when the 25 watts isn't really needed. The output is one watt in the low power position. There is a "monitor" position on the power switch which turns off the amplifier filaments and thus conserves battery power, if this is important.

The Gladding is surprisingly well made, particularly when you consider that price. The circuits are on boards, IC's are used, and there is a lot more shielding than you will see in most other rigs. The crystal compartment has its own shield, as does the receiver rf and i-f section and the final amplifier. The final is shielded both below and above the chassis!

The receiver is considerably better than some we've tested, probably due to the eight pole crystal filter in the 10.7 MHz i-f. We have an enormously loud repeater about 70 miles from here which runs about 15 hours a day average on 146.91. Many receivers are just about useless when this is on if we want to listen on 88 or 94, both among the most used channels in our area. If you have 60 kHz spacing to your nearest repeaters you probably won't have interference and a sharp i-f won't make that much difference, but if you've got a signal of substance just 30 kHz off channel, this may be an important factor to keep in mind. The advertised selectivity of the unit is 60 dB down at 15 kHz.

The receiver and transmitter crystals switch independently, so you can use the 34/94 pair or, if you happen to live in a run-down part of town where an old repeater is still grinding out 34/76, you are still set. By adding a 16 transmit crystal you will be on 16/76 for modernized repeaters. If you are uptight about your 34/76 repeater please try and ignore the sarcasm . . . but do let the idea of shifting to 16/76 perk somewhere in the back of your mind, even if it is way, way back.

All in all, we liked the Gladding 25 and think it is a remarkable buy. . . . Staff

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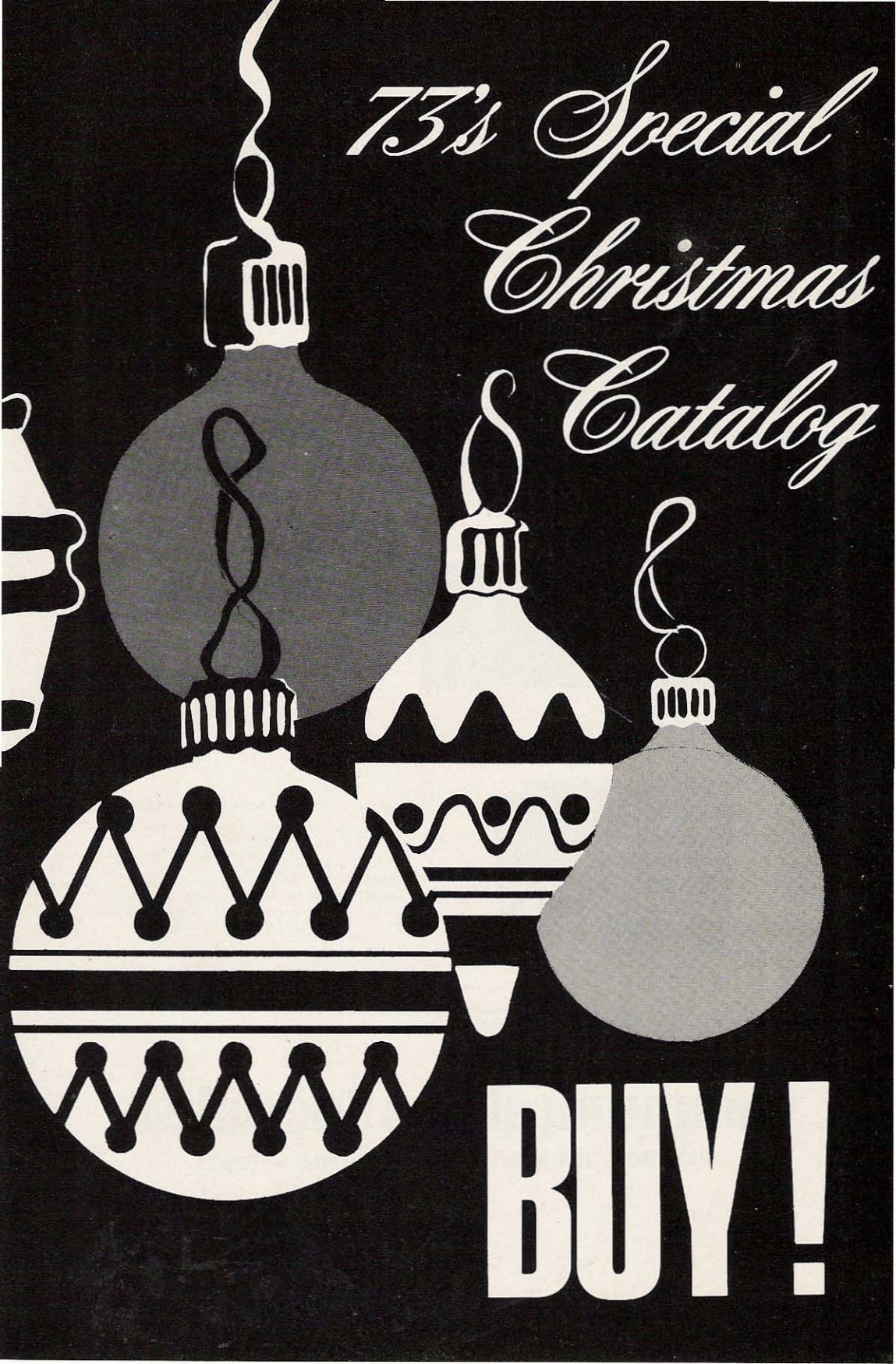
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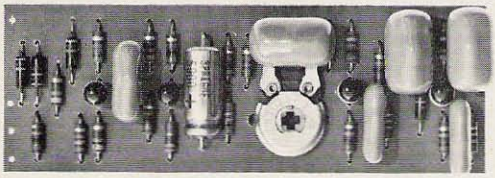

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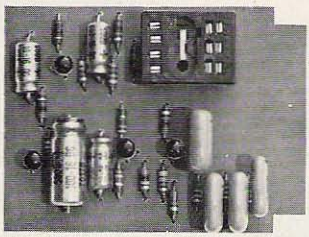

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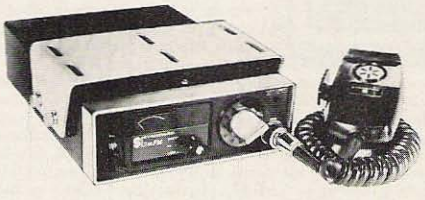

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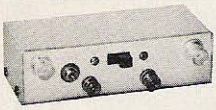

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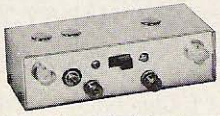

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Features a super low noise J-FET rated by T.I. as typically 1.2 dB N.F. @ 150 MHz (transistor data curves supplied with unit) and guaranteed by our lab to give under 2 dB actual N.F. in our circuit. Transistor is mounted in a socket with gold plated contacts. 4 precision trimmers make possible tuning for optimum desired results over a wide range of conditions. We supply it tuned for minimum noise figure across 50 ohms input and output resistance. Fully shielded in aluminum case with feed-thru solder terminals. Supplied with mounting kit for installing inside or outside your receiver. Tuned to the frequency of your choice from 135 MHz to 250 MHz with approximately 2—4 MHz bandwidth.

Model 102 price: $19.95

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• 11 crystal-controlled channels. • Available in your choice of frequencies from 135–250 MHz in any one segment from 1–4 MHz wide. • I. F. bandwidth (channel selectivity) available in your choice of +/– 7.5 KHz or +/– 15 KHz. • 8-pole quartz filter and a 4-pole ceramic filter gives more than 80 dB rejection at 2X channel bandwidth. • Frequency trimmers for each crystal. • .2 to .3 μvolt for 20 dB quieting. • Dual-gate MOSFETS and integrated circuits. • Self-contained speaker and external speaker jack. • Mobile mount and tilt stand. • Anodized alum. case, 6"x7"x1 3/8".

Model FMR-250-11 price: 135–180 MHz $109.95
181–250 MHz $119.95

Price includes one .001% crystal. Additional crystals $6.95 ea.

UHF 20 dB MIN. GAIN 3 to 5 dB MAX. N.F.

This model is similar in appearance to our Model 407 but uses 2 low noise J-FETS in our specially designed RF stage which is tuned with high-Q miniature trimmers. The mixer is a special dual-gate MOSFET made by RCA to meet our requirements. The oscillator uses 5th overtone crystals to reduce spurious responses and make possible fewer multipliers in the oscillator chain which uses 1200 MHz bipolars for maximum efficiency. Available with your choice of input frequencies from 300–475 MHz and output frequencies from 14–220 MHz. Usable bandwidth is about 1% of the input frequency but can be easily retuned to cover more. This model is now in use in many sophisticated applications such as a component of a communications link for rocket launchings.

Model 408 price: $51.95
.005% crystal included.

NOTE:

All the items on this page are for operation on 12 VDC. See back issues of 73 Magazine for some of our other products. Still available are our FMR-150-A at $89.95 and a line of frequency scalers starting at $99.50.

HOW TO ORDER:

State model, input and output frequencies and bandwidth where applicable. Remit in full, including sales tax if you reside in N.Y. State, direct to Vanguard Labs. Prices include postage by regular parcel post. For air mail or special delivery include extra amount, excess will be refunded.

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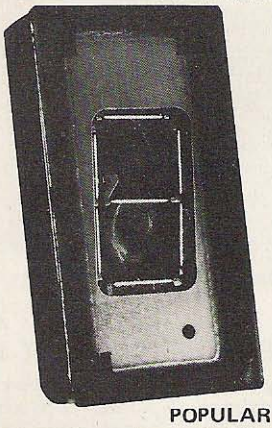

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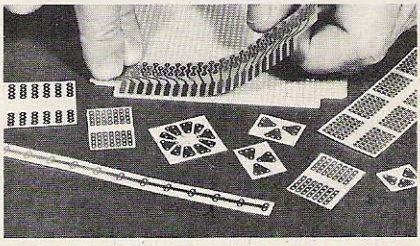

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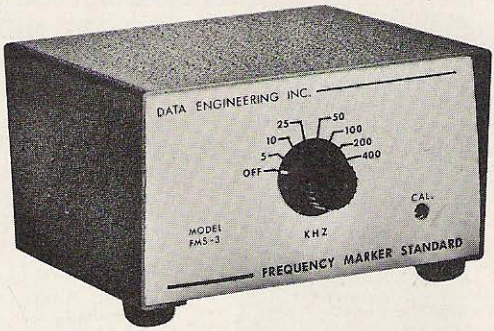

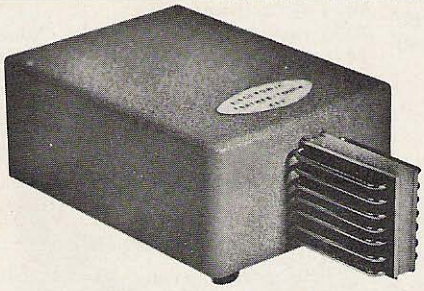

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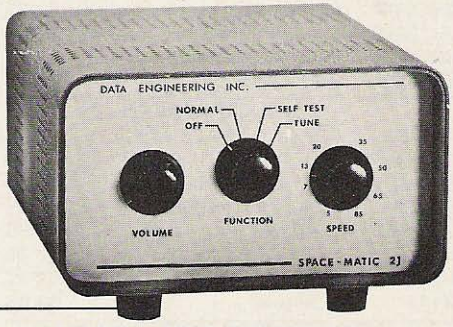

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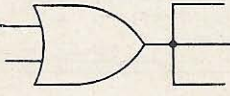

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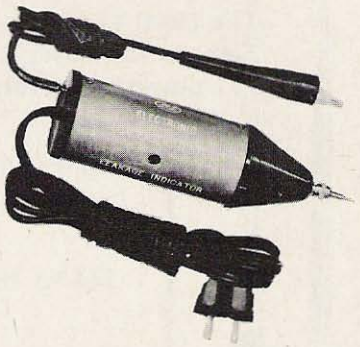

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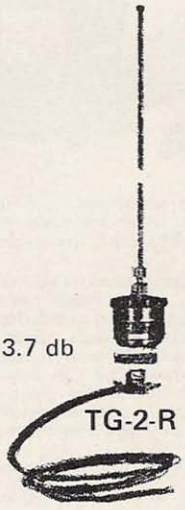

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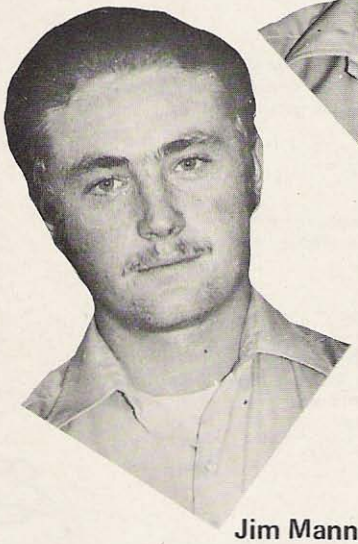

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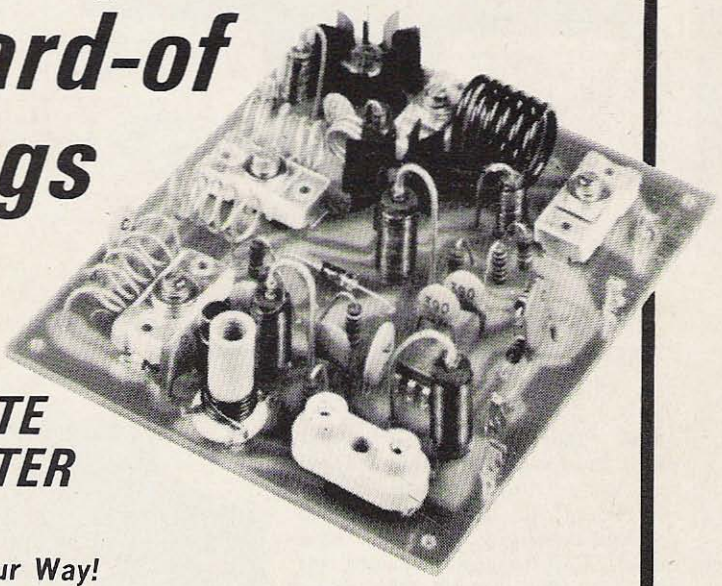

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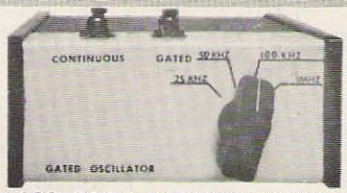
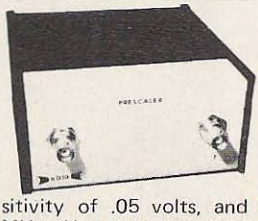
Gated Calibrated Marker Generator



The K-OSC.-G1 is a gated generator on and off 3 times per second making it easily recognized on today's crowded bands. Frequency – 1 MHZ, 100 KHZ, 50 KHZ, 25 KHZ. Accuracy – High Precision 1 MHZ xtal., 001%. Gate time – 3 Pulse per second. Harmonics – up to 200 MHZ. Output – Square wave 3.5 PP. Electrical Description – All solid state, printed circuit on 1/16" glass board. ICs 2 gates, 3 dividers, and 1 transistor. A ceramic trimmer allows zero-beating WWV. Physical description – The K-OSC.-G1 Generators are small, structurally rigid yet lightweight instruments which are designed for portability. The instrument is enclosed in a 3 color vinyl covered metal & plastic cabinet. Dimensions are 2 3/8" x 5 1/8" x 6".

K-OSC-G1 Wired and Calibrated $45.50
K-OSC-G1K Kits all parts and case (less batteries) $35.50

KD-10 PRESCALER



The model KD-10 is a sensitive prescaler with a divide-by-ten scaling factor. This prescaler is designed to extend the range of the many surplus 1 meg. counters. It has a front end sensitivity of .05 volts, and flip-flop speed of 20 MHz. Has a square wave output of 2.5 V PP. KD-10 has its own built-in power supply (regulated).

KD-10-K kit – Board and all parts (except cabinet and coax connectors). $22.50
KD-10 Complete with case and tested. . . $33.50
Cabinet and coax connectors (Same type cabinet as K-OSC.-G1). $7.50
KD-100-K kit – Board and all parts (except cabinet and coax connectors). $25.50
KD-100 Complete and tested. $36.50
KD-100 Divides by one hundred for use with 100 KHz counter.

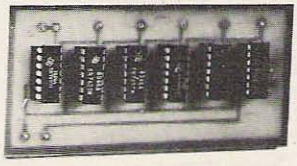
HEP 170 2.5A 1000V	10/$3.50	20/$ 6.00
1N 914 Signal Diodes	10/$3.00	20/$ 5.00
7490 Decade Counter	$2.10	5/$ 1.00
7441 Decimal Decoder/Driver .	$3.10	5/$15.00
UL 914 Gate	$ .55	10/$ 5.00
UL 923 JK Flip-Flop	$1.50	10/$ 8.00

DECIMAL COUNTING & READOUT KIT

K-DCU's are small readout kits which include amperex tubes, 7490 dividers, 74141 decoders and circuit board. The tubes and IC's may be plugged or soldered in as you desire. Boards are 1 1/8" x 3", 5 1/8" x 3" and 8 1/8" x 3".

K-DCU-1 Kit 1 tube, Board and IC's $12.50
K-DCU-5 Kit 5 tubes, Board and IC's . . . $55.00
K-DCU-8 Kit 8 tubes, Board and IC's . . . $80.00
IC Sockets for above . . . . . @$ .50
Amperex tube sockets (sold with board only). . . . . @$ .60

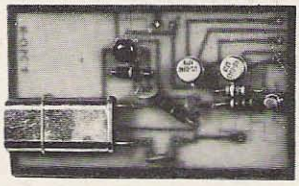
KEO-4 & 5 Oscillator 100 KHz 50 KHz 25



100 KHz 50 KHz 25 KHz RTL circuit followed by 1 stage amp. Used for band edge marker, clock driver for dividers below, Driver for 10 KHz divider audio frequency interperlation, etc. Power requirement 3-3.5 V 12 ma. deliver 2 V PP. Will operate as low as 2 V DC.

KEO-4 2¼" x 4" glass board wired, tested and Cal. $15.95
KEO-5 MHz 2½x4" board Wire Test Cal. . $15.95

KED-1 & 2 Divider Boards and Sockets Kits



TTL Divider board 10 MHz to 1 Hz designed to use with KEO-4 or 5 clock for counters or marker. Power requirements 4.75-5.5 VDC. 300 ma. uses SN7490 ICs.

KED-1 4 1/8" x 2" glass board 1 MHz to 1 Hz or 100 KHz to 1 Hz (without sockets or ICs) $ 4.00
Same as above with sockets & ICs $18.50
KED-2 4¾" x 2" glass board 10 MHz to 1 Hz (without sockets or ICs) . . . . . $ 4.50
Same as above with sockets & ICs $22.00

K ENTERPRISES

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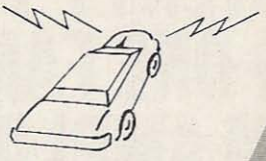

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(INCLUDES 2 PAIR CRYSTALS)

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TUNING FREQUENCY RANGE:	144-148 Mhz.
FREQUENCY STABILITY:	0.001% (from −30° to +60° C)
NUMBER OF CHANNELS:	4 Independent selector switch
USABLE SENSITIVITY:	0.5 uv or less for 12 db SINAD
SPURIOUS RESPONSES ATTENUATION:	Greater than −60 db.
AUDIO OUTPUT:	2.0 watts with less than 10% distortion.
POWER OUTPUT:	6 watts into 50 ohm

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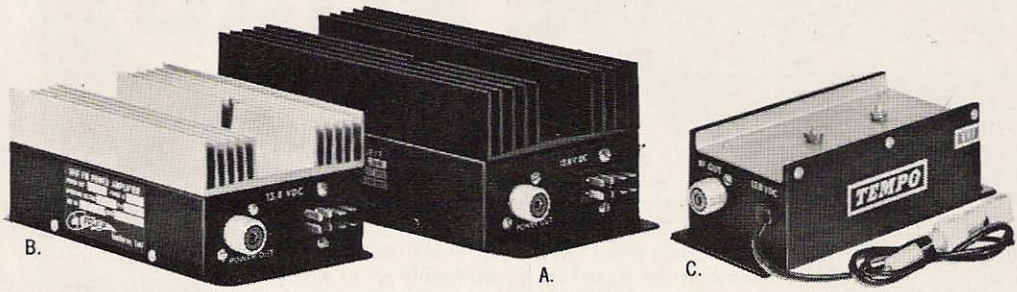


A. CT 1002-3

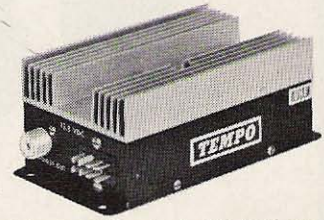
A true powerhouse. 10W input gives a guaranteed 120W output (In fact, typical output runs as high as 140W). Operates directly from a 12 VDC power source. Antenna switching is automatic when as little as 1.5W of RF drive is applied. The amplifier incorporates Balanced Emitter transistors and state of the art design practices, making it virtually immune to destruction due to high VSWR or misloading conditions. Features include THREE 40W output transistors plus one 40W driver transistor, low loss input coax connector (complete with RF cable), low loss solid state antenna switch (.5 db or less typical) and Spurious response: −60 db typ. All amps include a built in power output monitor for use with a Remote Control Head and may be used anywhere in the 2 meter band without the necessity of retuning. Only 9⅜" x 4" x 3", the CT 1002-3 can be installed almost anyplace. Since there are no switches or meters, it may be mounted under a seat, in the trunk or in a desk drawer. Power output: 120W. Input voltage: 13.8 VDC. Current required: 15-17 amps. Drive required: 5-15W for 100-140W out. Price $220.00

B. CT 802-2

A superior quality VHF FM two meter power amplifier. Only 6½" x 3½" x 3", yet contains all the features of the CT 1002-3 and provides a minimum of 80W output and typically 90W. Price $160.00

C. CT 252-A2

Unbelievably small . . . but outperforms many of the big ones. 1W input delivers an easy 25W power output. Only $85.00



CT 445-30

1 or 4W input . . . minimum 30W output. 450 MHz UHF. Same features . . . same superior quality as CT 1002-3, including low loss solid state antenna switch. Ideal for use with 1 watt handi-talkie or other low power UHF transceivers.

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MODEL NUMBER	POWER INPUT	POWER OUTPUT min.	BAND
CT6-30	1 to 10 W	30 W	6 M
CT6-60	1 to 10 W	60 W	6 M
CT6-100	1 to 10 W	100 W	6 M
CT1202-2	25 W	125 W	2 M
CT1002-3	5-10 W	100-120 W	2 M
CT602-2	5-10 W	60 W	2 M
CT 602-B2	1 W	60 W	2 M
CT 802-2	5-10 W	80 W	2M
CT452-2	5-10 W	45 W	2 M
CT452-B2	1 W	45 W	2 M

MODEL NUMBER	POWER INPUT	POWER OUTPUT min.	BAND
CT252-A2	1 W	25 W	2 M
CT352-2	8 W	30 W	2 M
CT 1250	25 W	100 W	2M
CT 220-20	4 W	20 W	220 MHz
CT220-40	4 W	40 W	220 MHz
CT220-80	4 W	80 W	220 MHz
CT445-1	100 mw to 300 mw	1 W	440 MHz
CT445-5	200 mw to 1 W	5 W	440 MHz
CT445-15	1 to 5 W	15 W	440 MHz
CT445-30	1 to 10 W	30 W	440 MHz
CT445-50	1 to 10 W	60 W	440 MHz

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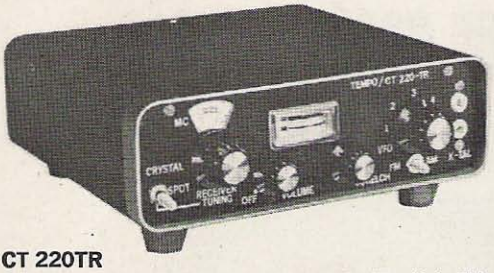
IT'S NEW...IT'S UNIQUE...THE TEMPO CT 220TR AM/FM TRANSCEIVER



CT 220TR

Don't let its small size fool you (it's only 7" wide). This little giant outperforms its big brothers. Look at these specifications . . . then look at the low price. Completely solid state. 220 to 225 MHz operation. Transmitter: Positions for 5 internal crystals (not supplied). 1 external crystal position and VFO input. Power Output: 4W FM, 1½W AM. FM internally adjustable to 15 kc. Power Requirements: 13.8 VDC XMT 1.2 amps FM .5 amp AM, 25 ma Stby. Receiver: Tuning meter for AM and FM. .6 micro-volt for 20 db quieting. Tunable or pre-set to five internally adjustable frequencies. FM is detected by limiter discriminator, 6 db at 15 kcs.
1W audio output — 5% distortion. Double conversion, 10.7 MHz and 455 KHz. ACCESSORIES AVAILABLE: AC Power Supply & Speaker. Internal amplifier to increase output to 20W FM and 8W AM. External high power amplifiers for FM operation. (CT 220-40 or CT 220-80 suggested.) Introductory price: $179.00

CT 220-20 AM/FM Amplifier

A truly significant new amplifier, the CT 220-20 measures only 6½" x 2" x 3". Operates from a 12 VDC power source. Antenna switching is automatic when as little as ½W of RF drive is applied. Incorporates Balanced Emitter transistors and state of the art design practices. 4W input provides 20W output on FM. 1½W input provides 8W output on AM. May be used anywhere in the 220 MHz band without the necessity of retuning.

CT 220-80

Another fine 220 MHz FM amplifier. 4W input/80W power output.

CT 220-40

A superb little 220 MHz FM amplifier. 4W input/40W power output.

CT 100BP

High current regulated power supply. 17 amps at 12.8V, includes speaker.

More exciting items coming from Tempo CT

CT Solid State Repeater: 220 MHz, 110 VAC or 12 VDC

A superior quality repeater, priced well below all others . . . offering true emergency operation. A 12V battery is maintained at full charge, takes over automatically in the event of an AC power failure.
FEATURES: Transmitter power-20W output. Receiver sensitivity is .5μv for 20 db quieting, has 6 pole monolithic crystal filter, minimum spurious and image rejection 70 db. Front panel discriminator monitoring meter (calibrated in Kc). Provisions for local mike, local speaker included. Standard 19" rack mount, 8" high. Transmitter & receiver encased in separate shielded compartments. Requires 2 antennas and 12V storage battery. (available in spring)

CT 2 Meter Transceiver:
Same specifications as 220 repeater.

CT 2 Meter Repeater: 8W AM, 15W FM.
Crystal controlled and tunable receiver. .35uV sensitivity. Provision for toneburst. 10.7 MHz crystal filter results in 70 db spurious and image rejection, adjacent channel selectivity, 70 db at 30 Kc. 11 channel transceiver.

CT 450 MHz Transceiver: 4W FM Specifications essentially same as 2 meter transceiver.

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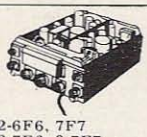

TRANSMITTER has 4 tubes: WE-316A, 2-6F6, 7F7
RECEIVER has 11 tubes: 2-955, 4-7H7, 2-7E6, 3-7F7
RECEIVER I.F.: 40 Megacycles
SIZE: 10-1/2" x 13-1/2" x 4-1/2". Shpg wt 25 lbs.

SPECIAL PACKAGE OFFER: BC-645 Transceiver. Dynamotor and all accessories, including mounting. UHF Antenna Assemblies, control box, complete set of connectors and plugs. Brand New **$26.95**

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Code practice tapes for above P.U.R.

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All tuning units available for above. P.U.R.

TV-10 UHF TRANSVERTER 28V. DC Made by Aircraft Radio Corp. Couples UHF Antenna to VHF transmitter and VHF receiver. Uses 6 tubes: 4/5763 and 2/6201. Includes 8 crystals ranging from 233.8 Mc to 257.8 Mc. Size: 11 x 4-1/2 x 4-5/8". Wt 5-1/2 lbs.
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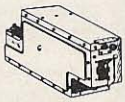

R48/TRC-8 UHF FM RECEIVER 230 to 250 Mc. Variable tuning, one band. 115/230 V 60 cy. Complete with speaker, phone jack, squelch circuit 2-1/2" meter for circuit testing; includes 15 tubes: 8/6AG7, 9002, 5U4, 6V6, VR-150, 6N7, 6SN7, 6AL7. Size 20 x 19 x 16". Weight 75 lbs.
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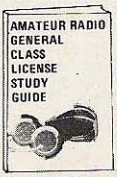

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Spurious & Harmonics: 46 db
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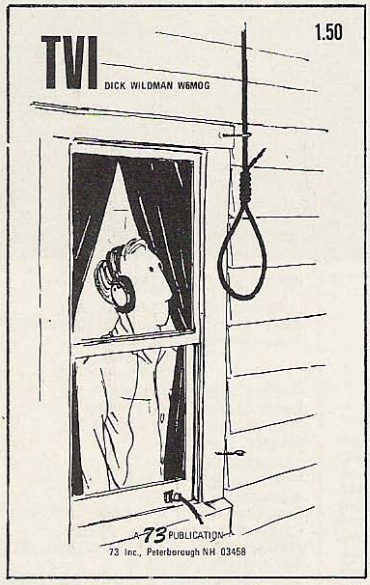

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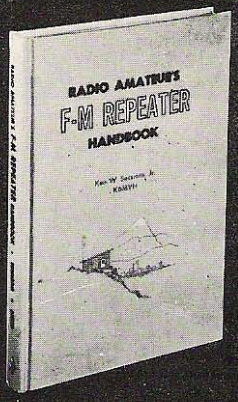

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The Handbook contains 208 pages of useful, hard-to-come-by information, and it's written in an interesting, personal vein by Ken W. Sessions, Jr. (K6MVH) former editor of FM Journal, now managing editor of 73.

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73 tests the GAM TG-5-S Gain Vertical

Perhaps "tests" is a bit extravagant. To be honest about it we didn't run tests with the antenna, we just decided to use it and thought you might be interested in the rationale behind the choice.

The repeater here in Peterborough is on top of Pack Monadnock Mountain. To be precise, the receiver is on top of the mountain and the transmitter is down about 300 feet or so about one half mile away. There are two reasons for separating the transmitter and receiver. One is to prevent desensitizing the receiver every time the transmitter comes on the air, which can be a serious problem when the two are side by side, and the other was to get that little extra gain the very top of the mountain obviously provides.

The tower beside the transmitter shack is 100 feet high. We put the antenna on top of the tower . . . probably because antennas are always supposed to be on top of towers, not at their base. But this brought on the obvious problem of some of the rf getting lost on the way up to the antenna. Though we used RG8/U foam cable for the job, the spec sheets still let us know that we can expect to lose about 2.5 dB over that length. Figuring a few more feet into the rig from the tower we manage to lose 3 dB over the path. That's one half of the power! Zounds!

The logical solution to that is to run more power. This is logical and expensive. If you figure it out at all, you will see that the most economical way to amplify your signal, within reason, is by putting up a gain antenna.

The specs on the Gam TG-5-S antenna tell us that it has a 10.5 dB gain over a coaxial antenna. That certainly would more than make up for the 3 dB feedline loss and might even make up a good deal of the difference between the transmitter and receiver heights. A repeater is working its best when it can be heard as well as it can hear. If it covers more area with its transmitter the mobiles can hear it clearly and not get into it, a most frustrating experience. If the receiver is better than the transmitter, then fellows go through the repeater who can't get the transmitter, a frustration to everyone who can hear the rig.

The first tests of the system, using a ground plane antenna on the receiver and the Gam TG-5-S on the transmitter, indicate that the coverage of both the transmitter and the receiver are fairly equal. Mobiles in Rhode Island have been able to work through the repeater to work mobiles in Maine, both over 100 miles away from the mountain.

The high gain of the antenna is achieved by placing and phasing the radiating elements one over the other. This squeezes the radiation pattern down toward the horizontal, giving the gain. Radiation at a high angle is wasted unless you want to do a good job on passing planes. . . .Staff

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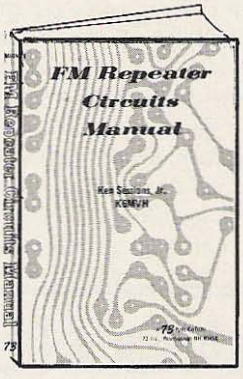

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The circuit (Fig. 1) gets connected to the horn button side of the horn relay. Wire A, originating from the gate of the SCR, is connected to the grounded case of the equipment to be protected. This prevents triggering of the SCR until the time that this wire is cut or disconnected. A thief, determined to steal a piece of equipment (ham gear, tape deck, radio, or outboard motor on a boat), by necessity must disconnect all wires leading to the equipment; in so doing he would unground wire A, allowing gate current to flow and trigger the SCR, which in turn would energize the horn relay (and, therefore, the horn or siren).

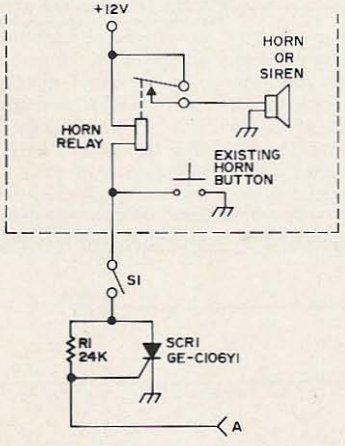

Fig. 1. Mobile theft alarm circuit.

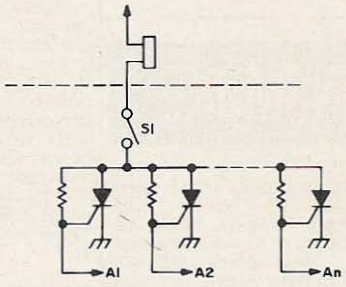

Fig. 2. Paralleling SCR circuits will protect several pieces of equipment, even though only one "safety" switch is needed.

To protect several pieces of equipment, the circuit must be duplicated as many times as needed with the exception of the switch.

Figure 2 shows how to protect several accessories or pieces of equipment.

. . .W1BHD■

E. M. Wagner G3BID
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England

DX QSO's or CONTACTS

A recent Leaky Lines discussed the broader aspects of DX, and deplored that DX contacts were always so brief. Here we have the nub of the point.

DX is *not* synonymous with contests. It can be the opposite. A contest, as the name implies, is solely competitive and no attempt is made to get to know anything about one's opposite number, nor is there time to do any comparative tests of a technical nature. A DX QSO need not resemble a contest contact. In fact, it can be a QSO either devoted to learning about the other fellow, or trying out some technical test or other.

I have been on several minor DXpeditions such as ZD3F, G3BID/6W8, 9H1BN, and G3BID/CN down to more mundane calls such as G3BID/LX and others; and have studiously avoided making nothing but contest contacts. Occasionally for perhaps half an hour or an hour I have worked contest style, but never for long periods. One of my short bursts of contest operations was in Southern Morocco when near Zagora. I had driven up a hill called the Djebel Zagora. I found 10 meters open to the States and worked one hour of contest contacts to give a lot of Ws a mobile contact from Morocco. But that was enough.

Next morning I heard a VK2 on 40 meters, but failed to contact him because he was working a W7 and, therefore, listening outside our band. So, changing bands, I worked another VK2 on 20 meters and got him to inform the 40-meter VK2 to look for me next day at the same time on 40 on his own frequency.

This resulted in a QSO (not a contest). Having established communication on 40 meters with the VK2 from the car, I asked him to listen carefully while I rotated the car through 360 degrees, and note my report. He just copied me for about 45 degrees either side of the peak signals and then lost me completely for the other 270 degrees. This gave a clear indication of the directional properties of the car. But there were two Gs also on frequency, and they reported little or no change as I rotated the car.

So we began to establish the difference between the directional properties of the car for low angle radiation, about 12,000 miles (long path) and for high angle radiation, about 1,500 miles. That is a DX QSO in my opinion.

In ZD3 and 6W8 I made a point of only working contest style contacts for a maximum of an hour at a time, but normally I had QSOs describing the scenery, the climate, the people I had met, as well as getting to know the people at the other end.

Because I have never worked in a contest even from the home station, and have always had QSOs, not contacts, I was able to meet many old friends on the air – amateurs I had worked frequently from England and elsewhere.

These personal QSOs even resulted in my being able to get a transceiver supplied by some very kind American friends to one of my friends in the Gambia and get a local radio club started under the auspices of the Prime Minister as first Patron. This club is

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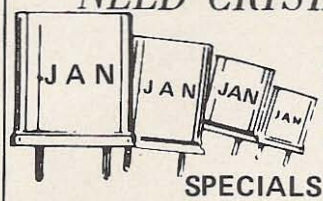

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now flourishing and took part in the Boy Scouts Jamboree in the air.

This is, I imagine, the different aspect of DX which you are seeking.

One of K2AGZ's articles refers to "Ugly Americanism" and looks forward to changing the opinions of foreign amateurs with respect to the overstressed image. May I as a Briton (not Britisher please) offer a suggestion or two?

May I make a plea for greater sincerity? Some amateurs put on a false and totally unconvincing friendliness, when clearly they are not genuinely interested. I have received printed QSL cards expressing great pleasure at this "personal" contact with friends overseas and thereby "helping to establish world friendship." If all this talk of "personal" contact and "friends" is printed, it smacks of insincerity. Few Europeans are likely to believe there is anything either personal or friendly if the whole thing is printed.

Of course, I use printed QSL cards. My call is printed. The type of rig is printed. The type of antenna is printed. The type of receiver is printed. The mode of QSO, CW, AM or SSB is printed and the address is printed. These are not personal. These are the same for everyone and make no pretence of being personal. But to print one's appreciation of a "personal" contact and "friendship" is degrading the words themselves, like the word "personalized" which often means "produced by the thousand," and exposes the insincerity of the amateur who sends them.

Obviously no human being likes all the people he meets – he would not be human if he did. Likewise, no radio amateur is going to enjoy a QSO with every amateur he meets on the air. One must be peculiarly insensitive if one cannot feel within a few minutes whether the QSO is going to be enjoyable or not. If one is obviously talking with someone with whom one has clearly nothing in common, with someone with whom the conversation will be dull and uncongenial, one can always sign quite politely and move off, but one need not then indulge in fulsome phrases which are obviously insincere, such as, "Look forward to meeting you further down the log" when it is quite clear that the personalities do not fit and there will be no pleasure in having another QSO; nor in saying, "Whenever you hear me on, please give me a shout," when it is clear that one hopes never to repeat the dull QSO which one is gladly about to end.

Real international friendship is not established by stereotyped insincere phrases. Apparently many amateurs do not realize that the insincerity comes across quite clearly, except under conditions of the very worst QRM.

It is, of course, easier to conceal the insincerity on CW where the tone of voice doesn't come across quite so clearly. But even here I wonder if the fist doesn't indicate whether the other fellow is enjoying the QSO or is only anxious to end it.

But, above all, the QSL which has printed remarks about "personal" QSO, "enjoyable" contact, or "friendship" are so palpably insincere as to spoil any illusion of there ever having been a "personal" or "friendly" contact.

. . .G3BID

J. A. Houser K2EE
23 Washington Street
Rensselaer NY 12144

CODE SHORTHAND

After one has learned the twenty-six letters of the alphabet, the ten numerals, and approximately ten punctuation marks, and progressed to about ten words per minute in code speed, he generally finds himself on a "plateau." Progress to greater code speeds seems for a time to come to a halt.

Progressive learning of any art (and code *is* an art), according to psychological research, takes place in "steps." But there are actually ways of advancing many steps at a time. This article is devoted to one of the many methods which can be used to skip a few steps and hasten the process of acquiring superior code speed in a shorter time.

It is comparable to the shorthand used by stenographers for years to write a language in the form of symbols. One of the principal ingredients of any shorthand is the use of "word signs." Practically all of the *short*, frequently used *words* in any language are represented by simple "word-signs," which are actually simple, very short strokes used to represent a word rather than use a multitude of strokes to represent the characters forming that word.

If one wishes to accrue superior code-copying ability, he will have to learn to read and copy words and short phrases just as readily as he copies single letters. In short, he learns word forms instead of single letter forms.

Actually, one of the first word forms to learn is "the" because it is used most often in the English language. It is no more difficult to copy – ···· · than it is to copy the character 9 (– – – – ·); and really, in terms of time-space, the two are about equal. The word "the" takes up 17 time elements, and the character 9 takes up 17 time elements, if one cares to count them up. It takes the same length of time to transmit the word "the" as it does to transmit "9."

In code, as in a lot of other arts, there is nothing quite like practice to make one proficient. Except, as herein noted, the time is spent in word-copy instead of letter-copy.

To facilitate the use of this system, a list of the short repetitive words used in the English language is given here for the student to practice. If you have a small, inexpensive tape recorder, it will pay to record these (each one at least five times) and then copy them back many, many times; and a good trick is to record them at the slow speed, then play the tape back for copy at double speed.

Two-letter words are more easily learned first:

OF TO OR ON AN HE NO DO
WE IN IT IS AM

Then, progress to three-letter words:

BUT THE AND WAS WILL SHE
HAS HAD NOT WHO FOR ANY

This will make progression to the four-letter words, as given below much easier, as a lot of the four-letter words are mere continuations of the two and three letter words:

WERE WILL THEY THAT HAVE
THEM WITH HERE FROM MORE THAN

The student can add many of these two-, three- and four-letter words to this list to record and copy at double speed.

Phrase Copying

The next step in speed-copying is to progress from simple words to phrases. In shorthand, phrases consist of combinations of word signs strung together.

Some of the simple, repetitive phrases found in common usage are listed herein as a guide to those that should be recorded and copied:

IT WAS	OF THIS	WITH THE
I AM	WILL HAVE	THEY ARE
THAT IS	FOR THE	IT WAS
TO THEIR	AND THEY	WE WILL
FROM THE	IT IS	OF A
IN THE	SHE WAS	DO NOT
WE ARE	IN AN	TO THE
HE IS	OF THEM	AND HE
HE WAS	WILL BE	THEY WERE
THAT WAS	ON THE	SHE IS
AND THE	TO THEM	THEY WILL

It will take from three weeks to a month with copy at the rate of at least one hour per day for the student to become proficient at copying these two-, three-, four-letter words and phrases.

But one will notice that automatically his code speed is increasing in direct proportion to his facility in copying. If one wishes more of these phrases, he can consult a "shorthand" book which will list practically all the phrases in common usage.

Prefixes and Suffixes

There is one more device which can increase the student's code speed immeasurably. This is to become proficient in copying prefixes and suffixes.

There is no greater truism than that in code copying the long words become the stickers. After copying the first few letters of a long word, the mind seems to go into reverse, and a letter or two in the middle is lost—and one might as well forget the rest of the word, because in attempting to copy the lost letter or letters, the complete word is lost. This is a common state of mental confusion (or mind block) and anyone who copies code knows about it.

By thoroughly learning the prefixes and suffixes, and shortening the "automatic response" time when they are encountered, the student gains copy time going into the middle of a long word, and then he has a better chance of copying the central letters; and by thoroughly automatizing the suffixes, if the copier falls a letter behind, and the suffix phrase is recognized, the student will automatically be able to quickly complete the word correctly.

Here is a list of some of the common prefixes used in the English language (these will vary somewhat with other languages):

ILL	MOT	SUB	EX	MOT
SEM	FER	WHE	CAR	PRE
UN	CON	MET	INF	ADD
ED	MEN	PER	AD	BRO
ALL	FOL	COM	TEN	INT
CO	POS	ANO	FOR	REL
DIR	ANTI	COL	EVE	TEM
REP	BOR	WE	BAR	PRO

Following is a list of common suffixes (word endings):

TION	ILY	AIN	ERT
ONE	LY	DENT	CED
MINE	ALE	CAL	ASE
ALT	DAY	SED	DER
EST	ANE	ITE	ANY
TON	ICT	ULD	ERY
ALY	CED	AIL	DED
ABLE	NAL	ISE	TES
OULD	SIGN	TER	ERS
INE	ATE	ANE	IBLE
ISH	ELF	ORY	OTE
IVE	IAL	TED	IST
IST	ESS	SES	THING
ING	TOR	END	BLY

It must be emphasized that the more common prefixes and suffixes, such as pro, ed, in, and, tion, ing, must be so thoroughly imbued in automatic reaction that there is absolutely no hesitation in recognizing them, and copying them as such.

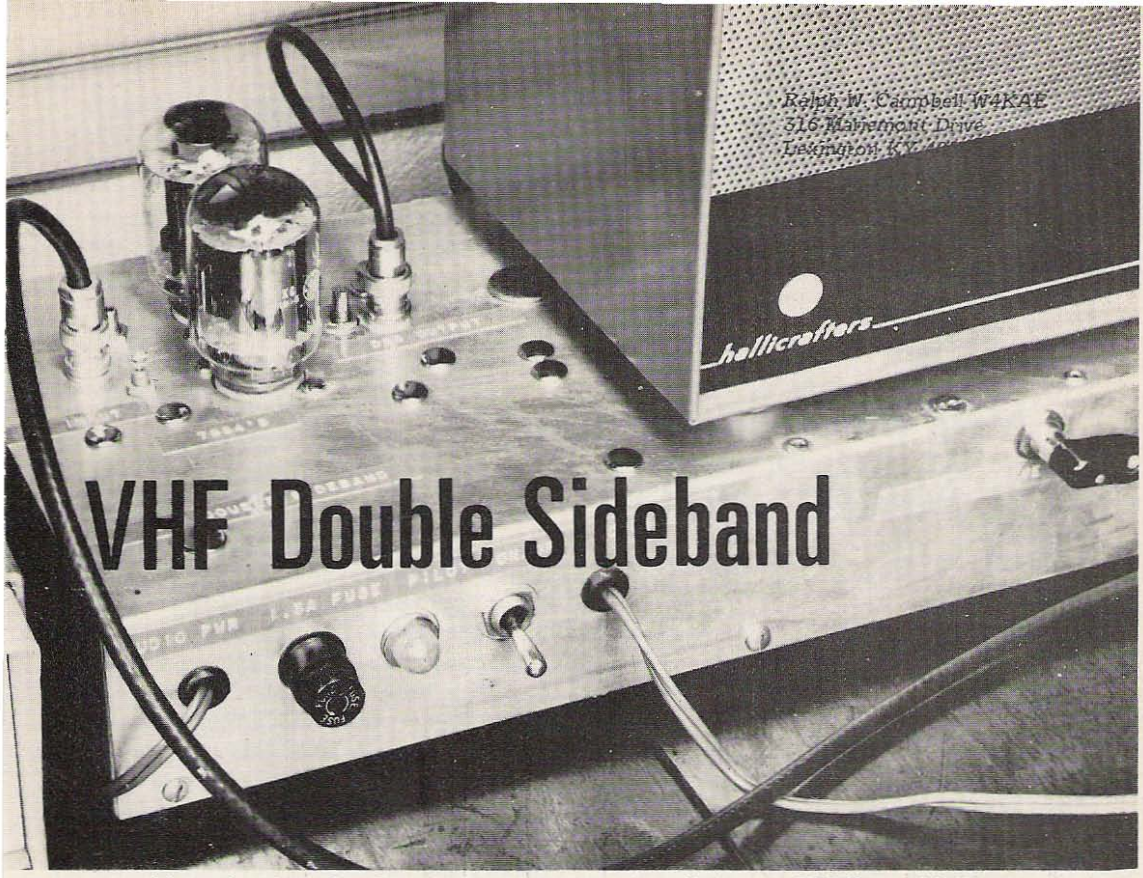
Prefix and Suffix Combinations

The reader should immediately recognize the fact that certain combinations of prefixes and suffixes actually form complete words—such as words like "promote," which consists of the prefix "pro" and the suffix "mote."

In longer words, such as the word "admission," here we have two suffixes following a prefix: "ad", the prefix and "miss," one suffix, followed by "ion," another suffix.

It should readily become apparent that once one becomes proficient in this type of code shorthand he will notice an immediate increase in his code-copying ability and his speed will jump from five to ten words per minute over any previous speed in a very, very short time. By the use of a trick system, the student has jumped a couple of steps, instead of struggling to take them one by one.

. . .K2EE■



VHF Double Sideband

Ralph W. Campbell W4KAE
316 Maramont Drive
Lexington, Ky.

Here is the simplest way of generating "almost SSB" on VHF. Avoiding the usual problems in generating SSB, this circuit shows how to build a Double Sideband Suppressed Carrier rig for 2 Meters. Why not start working real 2 Meter DX on groundwave!

Several years ago an article appeared in one of the amateur journals using tube types similar to those presented here, for DSBSC operation. I duplicated that design, but with disastrous results! It simply wouldn't work right. Five or six months went into constructing the unit, all to no avail – until I tried using slightly different pentodes in the balanced modulator configuration, based upon intelligent use of self-bias and adherence to the tube data.

Now, with piles of nonworking drilled chassis, partially destroyed 8156s and a half-melted 7984, I feel I am the authority for workable DSB. I worked Canada from Kentucky, with 2 meters "closed" and no aurora prevalent. If there's anything "wrong" with double-sideband, disregarding the confusion with AM radiotelephony, it is the operator's inability to tell which sideband he should tune. Operator error, plain and simple.

My ultimate goal is to provide fellow amateurs with a simple, reliable SSBSC generator using the phasing method as developed through my DSB efforts. DSBSC is practical, simple, and the best way to get your feet wet on sideband. All of your friends become only "appliance operators" you might say, if it is pointed out that heterodyning a commercial rig is not the same as building a sideband *generating* unit where results depend upon the home-brewer. With the equipment shown here, the next step is "single-double sideband," to coin a catchy term.

This article is entitled *VHF Double*

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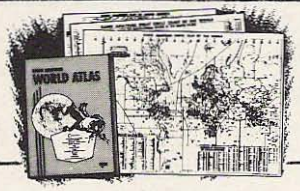

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Operating Class

"Class of operation" has been ignored by most authors when describing balanced modulators. Or maybe a quick appraisal as "pulse" has been thought adequate. I got a bit further. With the first high-level unit being made from 8156s I discovered some interesting things. First, plate voltage must be no higher than for normal class C operation. Second, fixed bias must not be used; resistor bias is adequate because there is no dc screen voltage present. And third, a swamped screen circuit is preferred for stability and development of audio voltage for generation of plate current pulses.

There was no need to place any dc voltage on the screen's centertap at any time. Plate voltage of about half of design maximum rating is plenty adequate with high perveance tubes, or consult the classified data for typical operation. If you should double the plate voltage, even within the design-maximum region, you'll find the distortion so high no one will know *what* you're running.

Getting back to our composite operating class – the grid circuit in my balanced modulator runs class C. You might say the audio-driven screens are running class B, since they're swamped but have some dc component on peaks, even though grounded like zero-biasing. The plate circuit is operating with large current pulses, however, so I guess we can call that portion "pulsed." So, the aggregate of these considerations might well be dubbed "class B, pulsed," as typical operation.

Plate Tank Circuit

Don't use excessively high-Q tanks on

VHF. A convenient way of avoiding this problem is by restricting your experimenting to a particular brand of split-stator "butterfly" capacitors, like the E. F. Johnson 160-series. The largest one they make in this M series is for 2 meters: The 160-211 is my choice.

Using ferrite or dust cores is not always recommended. Permacor X-7451 type IRN-9 material should find best application on 6 meters; but on 2 it is too lossy. IGC Ferramic Q3 material might find decent use above 100 MHz.

Another word on practical theory: Make sure an rf bypass is used for plate current pulses. It is not satisfactory to omit the bypass after an rf choke is used on a capacitive-split tank. The reason is that plate current rf pulses, at an audio rate, must be returned to ground. This speech-frequency pulsed energy can be strong enough to destroy a low-reactance button! Power supply filtering will help, but the lead reactance to the electrolytics can be so high as to result in lower DSB output and instability. In the next design I try I'm planning to use an *output* audio choke along with the electrolytics and silver mica 0.001s.

Turns Ratio

Turns ratio is interrelated with tank circuit considerations given earlier. However, the concept of matching a plate load impedance under pulsed conditions was attempted. We did this by using a reflectometer and driving the output tank backwards from the coupling loop. I was limited in achieving a perfect match by the output capacity of the tube and the LC ratio obtained. That is, the butterfly's capacity set this ratio and happily this seemed good for audio fidelity and not necessarily the greatest output. Presumably this is the sort of tradeoff that must always be made in an optimized design.

One and one-half turns for the coupling loop and at least 3.5 times this is okay for the total number of tank coil turns, depending upon size of coil wound. Tighter than usual coupling is sometimes desirable on VHF in cases where plate resonant load impedance is low. It should be remembered that plate power pulses are on a 4:1 duty

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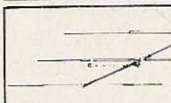

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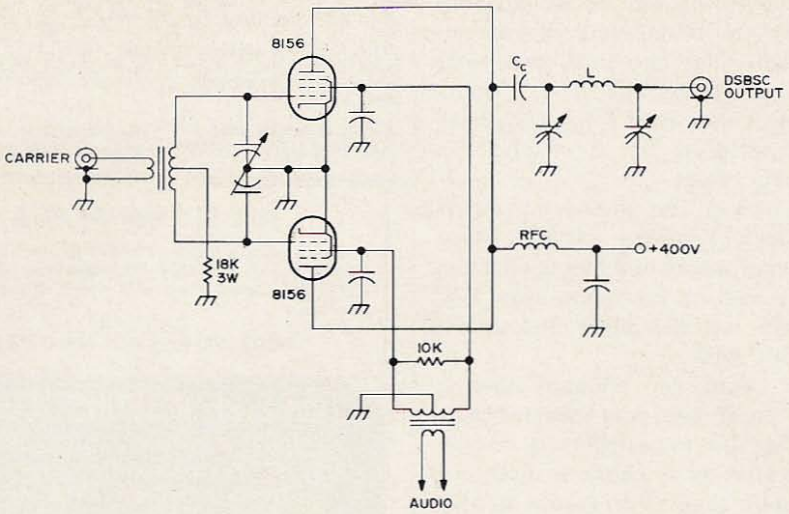


Fig. 1. Conventional method of generating DSB suppressed carrier.

factor with DSBSC (rather than 2:1, as with SSB).

Practical DSB Schemes

All DSBSC generators that do not result in high power losses utilize balanced modulators in one form or another. On VHF, with a commercially made exciter, the best way to go sideband is by using a high-level BM rather than a low-level one. The reasons are obvious: The TX-62 exciter in use at W4KAE already puts out 10–15W on 2m. And I drive much higher-power linears, which need additional watts PEP to push them to 500W average power output. Insertion amplifiers cannot be tolerated because of difficulty of obtaining adequate stability with very high peak powers. The several working circuits I recommend for stable operation follow:

Figure 1 shows the more conventional method of obtaining DSBSC on the HF bands. Usually, it is not necessary to add a differential capacitor, since the DSB gener-

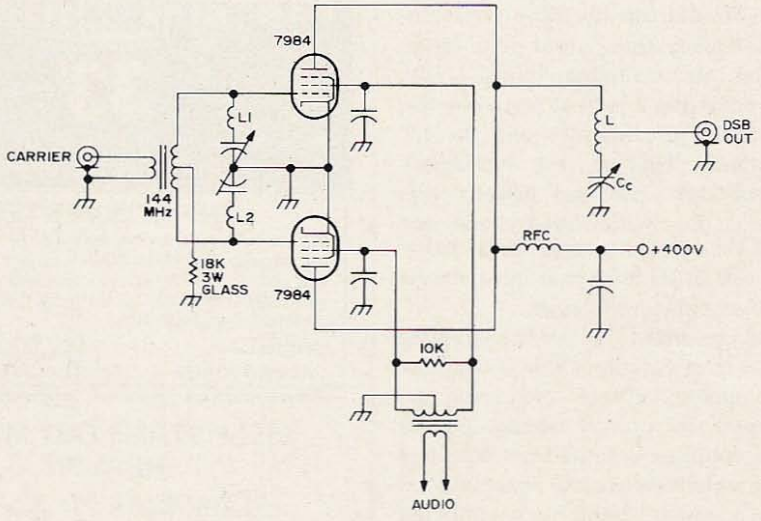


Fig. 2. W4KAE's original "divider input."

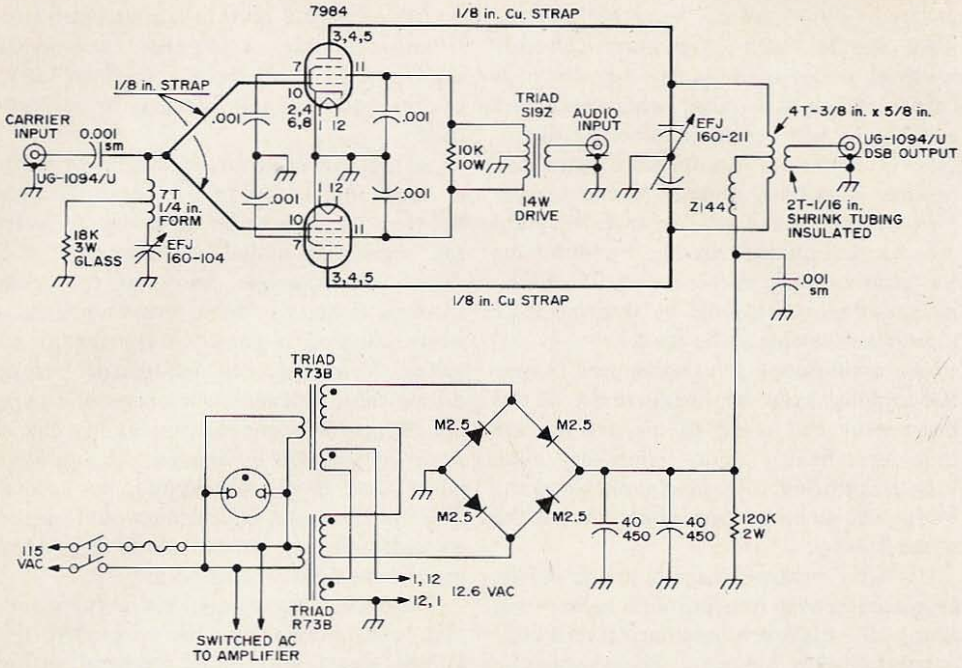


Fig. 3. Final 2m double sideband suppressed carrier transmitter and power supply.

ated results from 90° phasing either side of centertap. Quadrature phasing is simply half of 180° "push-pull."

Figure 2 shows a special push-pull "divider input," my own original design. This circuit is especially useful when very high capacities are encountered on UHF input circuits. The input transformer secondary is to be self-resonant with tubes in place and associated strays. Grid-dipping must be done before placing L1 and L2 in circuit. Once the broad-resonance condition exists, the two inductors should be peaked with the input butterfly so that *balanced series tuning* with both tubes' input circuits is obtained.

Figure 3 is a most successful medium-powered DSB ham rig. Featured is a high current supply made from two Triad 200 mA low-voltage power transformers whose windings conveniently series to provide 400–450V. A total of 80 μF is needed for filtering to get a T9 note on the nulled carrier. Carrier suppression is –36 dB, even so!

An inductive divider is used on input. The 10 kΩ, 10W wirewound resistor is a swamper which provides increased stability when audio gain is opened up about ¾ turn. It also provides an impedance match to the hi–fi amplifier used in BM service.

Alignment and Adjustment

To tune the balanced modulator, all you need is about 5W of rf drive (from HW-17 or TX-62) and an swr bridge. The bridge is used as an output indicator. First peak the grid circuit for a small meter deflection, with sensitivity control at maximum and key down. The BM should be plugged-in and turned on, of course. Notice that the peak can be increased greatly by output tank adjustment – if it cannot, disassemble the unit and check to see if tank variables are within stator mesh. Grid-dipping can help greatly here, before firing up.

When both input and output peaks are obtained (with no audio feed), the swr bridge sensitivity can be turned back to about 10% full-scale and some audio can be

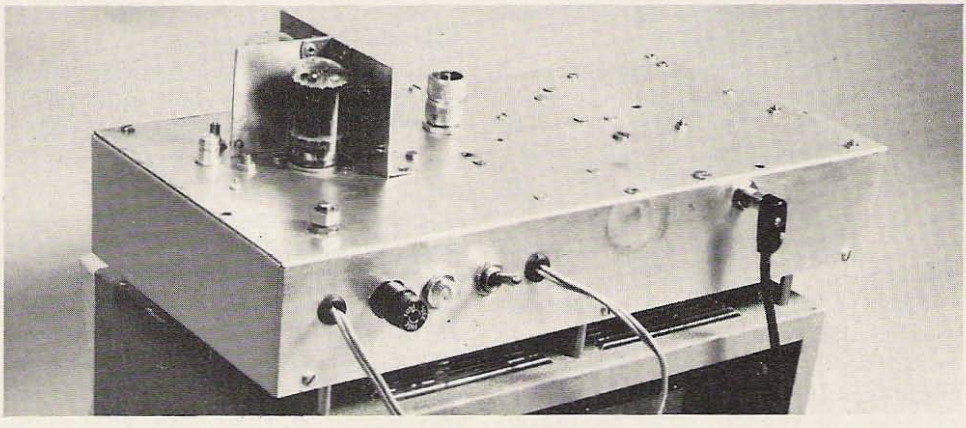
injected to the screens. Speaking into the mike should cause momentary full-scale readings. Driver must operate key down, as before. There is a point where increased audio gain will result in increased distortion (I listen on headphones while my receiver is partially muted). With a *dummy load* connected and vswr normal, the point can be determined visually by observing the erratic output meter indication. Eliminate residual shack noise by shorting mike input when setting audio level.

An oscilloscope can also be used to gage flat-topping; however, inexpert use of this instrument can result in disaster quicker than by reliancee upon elementary auditory monitoring with headphones and the bridge. An itemized procedure without the scope follows:

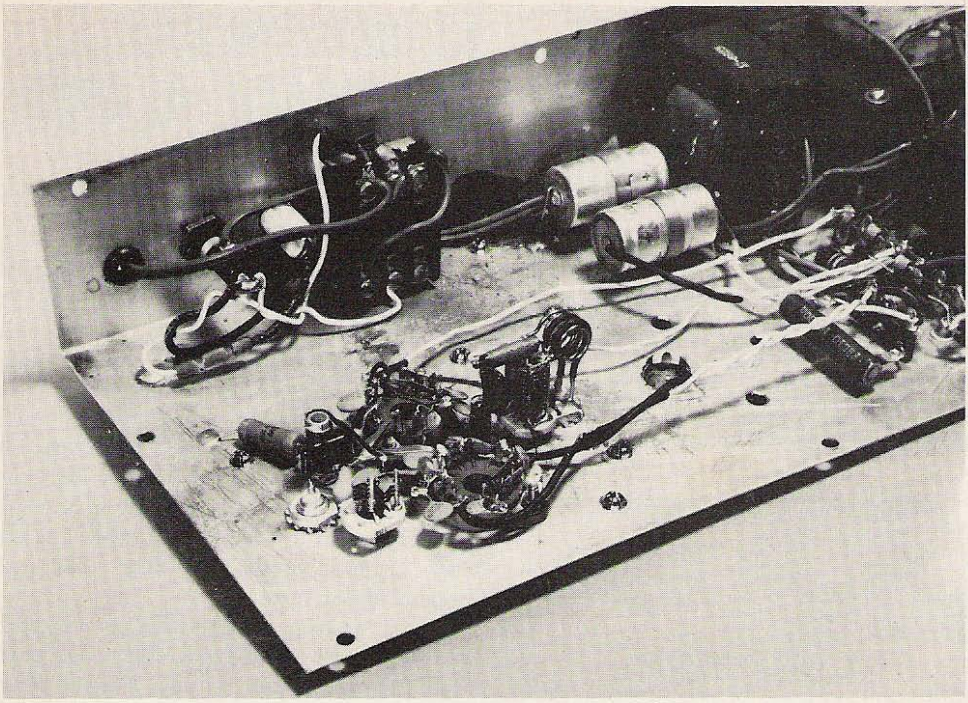
1. After peaking the circuits as above, keep feedthrough indication no higher than about 10% highest momentary level (without speech, key down). 2. There should be no variation in feedthrough level with the microphone switched off. 3. Juggle the drive level so that enough excitation is present to allow maximum deflection on the output indicator, but not so *little* as to *not* allow whatever loud vowel sounds may be spoken to register full-scale momentary indication. Note: This rf driving range is quite broad, i.e., from 1 to 5W (estimated) on the paralleled grids because resistor bias is self-regulating. 4. Repeat these steps until you're sure there's no instability, exciter (driver final) heating, or rf feedback.

Actual carrier suppression is much greater than merely 10 to 1! The difference between the indication of so-called "average" signal and nulled carrier is about 100 times. For example, most of the feedthrough is simply drive power or capacitively coupled in-phase energy that is rejected from balanced modulator output during those intervals when speech is present. Remember, in-phase energy like this is normally rejected by any voltage amplifier when used in power circuits, by normal 180° phasing. An exception would be the cathode follower current amplifier, or the grounded-grid power amplifier.

To finish adjustments I found it convenient to listen again on my receiver to the DSBSC signal, with upper sideband setting preferred. I do this with the rf gain all the way back. That sing-songy sideband sound is reassuring. Careful adjustment of tuning results in good-quality sideband. An oscilloscope might find use, now, as a final check. Calling a friend to check out your gear is an excellent way also. Experience will show you need *not* try for momentary-peak indications on a monitor to be



This photograph shows the completed DSB unit and its mounting upon the Heathkit AA-13 monophonic amplifier. The three-leaved inter-partition shield is necessary to prevent oscillation and resultant instability. Two types 8156s are depicted, although the final "4th generation" version uses 7984s. A screwdriver adjust pot is provided; however, this was abandoned when we went to self-bias as opposed to fixed.



Here's the final version (underside) of W4KAE's DSBSC rig. Note the inductive divider series tuned input made from an E.F.J. "M" capacitor and a ceramic form series coil, connected with 1/8th in. strap. The silver mica 0.001 capacitor connects to the "Y" going to both control grids in parallel. Output tank has moderate L to C ratio, using a 160-211 butterfly variable which establishes rf ground.

the same as full carrier indication at the same power level: this is because the meter damping will not allow true "peak" readings. Because of this, don't "talk up" to the same level you used to run on AM.

Use and Conclusion

Using the 2m VHF double-sideband rig is fun. Most SSB stations in Cincinnati could not tell the difference between it and their mode. DX stations like VE3BIG could copy very well; however, the only problems (with DX) came when a multipath fadeout forced retuning on their part, and confusion resulted in which sideband to use. This is not as great a problem as might be expected, however, because we use the piggy-back method of DXing and everyone stays right on frequency (no tail-ending)!

Concern about wasted power in the other sideband is almost academic in practical operation, since duty cycle is quite low for SSB or DSBSC. If "they" can hear you at all, chances are the lost energy is unimportant. If your linear can be run at slightly lower plate voltage than normal, you can get some increase in signal by overdriving it a little – getting rf clipping this way – but don't crank the audio up into the balanced modulator.

The one disadvantage to DSB is the operator confusion previously mentioned: It's not so bad on DX, but 80-mile Cincinnati stations tend to become relaxed in a long QSO and sometimes they forget which sideband to tune, winding up with a 3 kHz offset on alternate transmissions! I'm sure this problem can be overcome if operators learn to switch sidebands on their recivers, when hearing backward speech, instead of trying to retune for just one sideband. With DSB, you should always switch from UPPER to LOWER or vice versa, when hearing "backward" speech – then retune.

. . .W4KAE■

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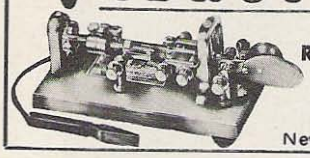

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73 tests the 270 AUTOMATIC ALARM

And likes it . . . and likes it!

After having a nice brand new Standard FM transceiver ripped out of an assistant editor's car, and further to find that this multi-centibuck investment brought nothing from the assorted insurance companies (which are gradually bleeding us of as much green corpuscles as they can) but shrugged shoulders and polite letters of too bad but we don't feel that we covered you for this, nervousness set in every time I looked at the mass of two meter FM gear that had accumulated in my car.

Never one to go at anything in ham radio half way, I set about being able to get into all of the repeaters in W1- and W2-land from my car. This built up into three rigs and three antennas around the top and back of the car, making it look like a wounded porcupine scuttling down the road. I was able to hide two of the rigs in the large Rover glove compartment, thus keeping them out of sight when not in use, but this still left a third sitting up on the dashboard as a tempting prize for any enterprising youth. This isn't much of a problem in New Hampshire, of course, but then I do drive down to New York and other areas where the life of an exposed piece of gear is measured in minutes, and it is a drag to have to put the rigs in the trunk every time I park.

Being an avid reader of 73 magazine, I could hardly help but notice that ad in the November issue by Technical Product Development Company for an automatic alarm. I went the whole way and ordered one of their Model 270 Automatic alarms, complete with siren. The alarm gadget costs $50, if you get it with all the options. This includes a recycler which turns off the siren after about two minutes and resets again automatically to guard against re-entry. The alarm is $40 without this feature. A manual model is available for $30 with the recycler and $20

without. The siren is $19 if you prefer that to using your regular car horn. There is something particularly alarming about a siren, so I went that route. I figured there would be no question if I heard my car sounding off in a distance that way.

So there was old fumble-fingers Wayne, armed with the alarm system, a set of instructions, and a pair of wire cutters. The whole operation took me just under two hours, and that included a couple of pauses for coffee, a long phone call from an author, and some hunting around the house for solder lugs and screws that I turned out not to really need. I think one hour would have done it if I could have kept my mind on what I was doing.

When the job was done there came the good old "smoke" test. I sat in the car, turned off the ignition, waited one minute and then opened the car door. Would it work? Ten seconds later the siren let loose and the whole east end of Peterborough knew that it worked.

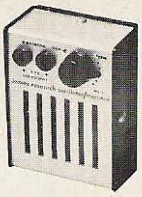
You have about 40 seconds or so after you turn off the ignition to get out of the car and close the doors. Then the alarm arms itself and is ready to let out a howl that will panic anyone within a hundred yards. You have seven seconds or so after opening the car door to turn on that ignition key before all hell breaks loose. Imagine the panic some night when I get into the car and manage to drop the key. I am able to do this . . . I've proven it.

A few weeks ago I was getting out of the car and somehow the ignition key caught on the steering wheel and flipped out of my hand. Big deal, right? Well, Lin and I hunted for fifteen minutes trying to find where it went. We looked everywhere! We checked in the seats, under them, under the floor mats, glove compartments, and on and on and on. We checked outside the car . . . nothing! Was it an apport? Thank heavens I didn't have that alarm set up then.

Now, I'm ready for downtown Boston . . . even for New York! Perhaps I am being too smug. Knowing New York, they may well steal the alarm along with everything else. But they'll have to work for it and their eardrums will never be the same.

. . .W2NSD/1

mark2
oscillator/monitor



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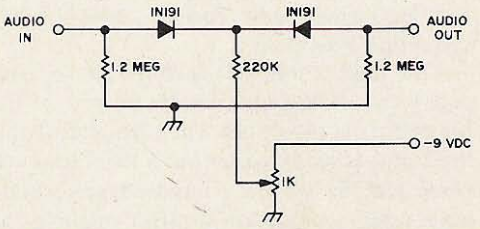

Fig. 1. Simple squelch circuit. Install before final audio amplifier.

The squelch circuit can be inserted between the last audio stage of the receiver and the final audio amplifier. The squelch level is set by varying the 1K pot. Power is most easily obtained from a 9V transistor battery.

. . .Larry Jack WA3AQS

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HAWAII	21	21	14	7	7	7	7	7	7	14A	21A	21A
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JAPAN	21	14	7B	3A	3A	3A	3A	3A	7	7	7B	14
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SOUTH AFRICA	14	7B	7	7	7B	7B	7B	14	21	21	21	14
U. S. S. R.	7B	7	3A	3A	7	7B	7B	7B	14	7B	7B	7B
EAST COAST	14	7A	7	7	7	7	7	14	21	21A	21A	21

A = Next higher frequency may be useful also.
B = Difficult circuit this period.